

**SAMOA JOINT CANNERY OUTFALL**

**EFFLUENT BIOASSAY TEST RESULTS**

2006 Tradewind Season

and

2006 Supplementary

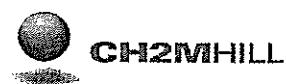
November 2006 Sampling  
and

May 2006 Sampling

**CH2M HILL**

**4 April 2007**

# TECHNICAL MEMORANDUM



## BIOASSAY TESTING – JOINT CANNERY OUTFALL EFFLUENT SUPPLEMENTARY MAY 2006 SAMPLING AND REGULAR NOVEMBER 2006 SAMPLING

**Prepared For:** StarKist Samoa (NPDES Permit AS0000019)  
COS Samoa Packing (NPDES Permit AS0000027)

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**Date:** 4 April 2007

**Distribution:** Carl Goldstein  
United States Environmental Protection Agency, Region 9  
Peter Peshut  
American Samoa Environmental Protection Agency

### Purpose

This memorandum presents the results of the supplementary bioassay testing of the Joint Cannery Outfall effluent sample that was collected in May 2006 and the regular semi-annual effluent sampling of November 2006<sup>1</sup>. The testing is required by the NPDES Permits that became effective in January 2001. The supplementary sampling in May 2006 was collected because of laboratory errors that occurred in the previous March 2006 test. The November 2006 sampling is the twelfth required semi-annual test required by the current permits. The May 2006 is the twenty-eighth test and the November 2006 is the twenty-ninth test conducted since toxicity testing of the Joint Cannery Outfall effluent began in 1993<sup>2</sup>.

### Study Objectives

Section D.1 of the StarKist Samoa and COS Samoa Packing NPDES Permits requires that semiannual definitive acute bioassays (96-hour static bioassays) be conducted on the cannery effluent. The purpose of these tests is to determine whether, and at

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<sup>1</sup> The semi-annual joint cannery outfall effluent bioassay tests are performed during the Non-Tradewind and Tradewind oceanographic seasons.

<sup>2</sup> Testing was not conducted during 1999. Extra tests using two organisms were conducted in March 1995 and February 1996.

what effluent concentration, acute toxicity may be detected for the combined joint cannery effluent discharge into Pago Pago Harbor.

### **Study Approach**

The U.S. Environmental Protection Agency (USEPA) has conducted a number of reviews of the effluent sampling, analysis, and bioassay tests conducted in the past. All comments from USEPA have been incorporated into the sampling and sample handling standard operating procedures (SOP) or have been incorporated into the procedures used by the laboratory doing the test. The comments, responses, and SOP have been documented in previous reports.

The NPDES permit conditions require that the bioassay tests be conducted with the white shrimp, *Penaeus vannami* (postlarvae). In the event *Penaeus vannami* is not available at the time of the tests, the permit specifies the substitute species, *Mysidopsis bahia*, which now has been renamed *Americanysis bahia*. For the May and November 2006 samplings, *Penaeus vannami* was not available and *Americanysis bahia* was used.

Effluent samples were collected from the StarKist Samoa and COS Samoa Packing facilities as 24-hour composite samples. The acute effluent bioassay test was conducted using a combined, flow-weighted, composite effluent sample made up from the effluent samples from both canneries, as allowed by the NPDES permit condition. This combined effluent bioassay is representative of the wastewater discharged from the joint cannery outfall to Pago Pago Harbor.

### **Effluent Sampling Methods**

The May 2006 effluent sample was collected between 09:00 on 24 May 2006 and 06:00 on 25 May 2006. The November 2006 effluent sample was collected between 09:00 on 7 November 2006 and 06:00 on 8 November 2006. For both tests a 24-hour flow-weighted composite sample of final effluent was collected from both the StarKist Samoa and COS Samoa Packing effluent discharges. Samples were collected from the established effluent sampling sites. Detailed sampling procedures are described in the established SOP for cannery effluent sampling.

A total of eight grab samples were collected into 1-gallon plastic cubitainers at each cannery for each sampling. Samples were collected at approximately three-hour intervals over the 24-hour period. The samples were stored on ice or in a refrigerator until the completion of the 24-hour sampling period. After all samples were collected a 5-gallon flow-proportioned composite sample was prepared. The grab sample collection times, effluent flow rates, and the relative effluent flow

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volumes calculated from plant flow records are summarized in Table 1 for the May 2006 supplementary sampling and in Table 2 for the regular November 2006 sampling. The relative effluent flow volumes were used to prepare the final composite sample, which was used to fill the sample container shipped to the laboratory for testing.

A 5-gallon cubitainer containing the composite sample was packed on ice in an ice chest for shipment to the laboratory. A chain-of-custody form for the sample was completed and sealed into a zip-lock bag and taped inside the lid of the ice chest. The sample was shipped via DHL to the testing laboratory. The chain-of-custody forms and the DHL waybills for each of the tests are provided in Attachment I.

**Table 1**  
**StarKist Samoa and COS Samoa Packing**  
**24-hour Composite Effluent Sample for Bioassay Testing**  
**May 2006 – Supplementary Sample**

Grab Sample Number	COS Samoa Packing		StarKist Samoa		COS Samoa Packing Percent of Total Flow	StarKist Samoa Percent Of Total Flow
	Sampling Date and Time	Effluent Flow Rate (mgd)	Sampling Date and Time	Effluent Flow Rate (mgd)		
24 May 2006						
1	09:00	0.88	09:00	1.7683	3.4	6.9
2	12:00	0.84	12:00	2.8829	3.3	11.2
3	15:00	0.68	15:00	2.4480	2.6	9.5
4	18:00	0.78	18:00	2.6626	3.0	10.4
5	21:00	0.98	21:00	2.3947	3.8	9.3
25 May 2006						
6	00:00	0.68	00:00	2.7216	2.6	10.6
7	03:00	0.68	03:00	2.2118	2.6	8.6
8	06:00	0.88	06:00	2.4221	2.5	9.4
Total		6.16 <sup>A</sup>		19.51 <sup>A</sup>	24.0%	76.0%
Mean		0.77		2.44	Total = 100%	
<sup>A</sup> Numerical total of column for calculation purposes. Total flow over period will be approximately the calculated mean.						

Bioassay Testing – Joint Cannery Outfall Effluent  
May 2006 Supplementary and November 2006 Sampling

**Table 2**  
**StarKist Samoa and COS Samoa Packing**  
**24-hour Composite Effluent Sample for Bioassay Testing**  
**November 2006 Sample**

Grab Sample Number	COS Samoa Packing		StarKist Samoa		COS Samoa Packing Percent of Total Flow	StarKist Samoa Percent Of Total Flow
	Sampling Date and Time	Effluent Flow Rate (mgd)	Sampling Date and Time	Effluent Flow Rate (mgd)		
7 November 2006						
1	09:00	0.72	09:00	2.03	2.86	8.06
2	12:00	0.72	12:00	2.12	2.86	8.42
3	15:00	0.74	15:00	2.22	2.94	8.81
4	18:00	0.74	18:00	2.76	2.94	10.96
5	21:00	0.74	21:00	2.59	2.94	10.28
8 November 2006						
6	00:00	0.80	00:00	2.40	3.18	9.53
7	03:00	0.80	03:00	2.41	3.18	9.57
8	06:00	0.80	06:00	2.60	3.18	
<b>Total</b>		6.06 <sup>A</sup>		19.13 <sup>A</sup>	24.1%	75.9%
<b>Mean</b>		0.76		2.39	Total = 100%	

<sup>A</sup> Numerical total of column for calculation purposes. Total flow over period will be approximately the calculated mean.

### Bioassay Testing Procedures

EnviroSystems, Inc. located in Hampton, New Hampshire conducted the bioassay tests. The testing procedures and results of the bioassay tests are provided in the laboratory report included as Attachment II for the May 2006 sampling and Attachment III for the November 2006 sampling. This report summarizes the 96-hour acute bioassay tests conducted with reference to the (USEPA) document Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms (EPA-821-R-02-012), 2002 as the source of methods for conducting the test. The bioassay tests were conducted considering and including USEPA's comments on previous bioassay tests, as documented in previous reports.

For both tests the test organisms were ≤ 5 days old and the test temperature was to be held at a nominal 20 °C. For the May 2006 sampling the actual temperatures ranged between 19°C and 21°C and for the November 2006 tests the temperature remained constant at 20°C. Salinity was adjusted to 25 ppt at the start of both of the

tests and ranged during the May 2006 test between 24 and 28 ppt. During the November 2006 test the salinity ranged between 25 and 30 ppt.

Demonstrated potential for a lethal immediate dissolved oxygen demand (IDOD) and a delayed dissolved oxygen demand spike (DDOD) had been discussed and documented in previous technical memoranda, which describe the first two tests conducted in 1993. Therefore, all of the bioassay test chambers should have been continuously aerated during the bioassay tests to maintain adequate levels of dissolved oxygen (DO)<sup>3</sup>. The test should also be renewed with pre-oxygenated effluent sample at 48 hours. However, for May 2006 sampling the laboratory failed to follow these procedures during this test and the DO went to lethally low levels in the higher effluent concentrations within the twenty-four hours of the test at the 75% and 100% concentration levels. (See the Laboratory Report in Attachment II.). This same error had occurred during the March 2006 test and was the primary reason for conducting the May 2006 supplementary test<sup>4</sup>.

Because of the low DO levels the toxicity of the May 2006 effluent could not be determined. The apparent toxicity caused by the low DO levels is higher than the actual toxicity. Since the results of the test show that the apparent toxicity (although masked by low DO levels) is still reduced to acceptable levels well within the ZID, the results of the test are being reported below.

Bioassay tests were carried out for effluent concentrations of 100, 75, 50, 25, 12.5, and 6.25 percent as vol: vol dilutions in seawater. Water quality was monitored daily and parameters measured included DO, pH, salinity, and temperature. Total residual chlorine and ammonia were also measured. Water quality data are provided in the Laboratory Report (Attachment II and III). Reference toxicant tests using sodium dodecyl sulfonate (SDS) are conducted regularly by ESI with the relevant tests completed on 30 May 2006 and on 06 November 2006 for which the results were within the acceptable range based on the 20 most recent laboratory reference toxicant tests.

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<sup>3</sup> The high initial dilution of the actual effluent discharge (>100:1) into the Harbor, in a very short time, eliminates any concern about IDOD effects in the receiving water.

<sup>4</sup> During the March 2006 test the renewal water was not aerated causing the DO to go to lethal levels in one of the 50% effluent chambers and all of the 75% and 100% effluent concentration chambers.

### Summary Results: Americanysis bahia Effluent Bioassay

The results for the May 2006 bioassay tests are included in Attachment II, and the results of the November 2006 tests are included in Attachment III. The results for the May 2006 mysid bioassay tests indicate the 96-hour LC<sub>50</sub> for the effluent tested was 32.7% percent. The no observable effects concentration (NOEC) for the 96-hour bioassay was 12.5 percent and the least observable effects concentration (LOEC) was 25 percent. Results on a daily basis are summarized in Table 3.

The results for the November 2006 mysid bioassay tests indicate the 96-hour LC<sub>50</sub> for the effluent tested was 43.1% percent. The no observable effects concentration (NOEC) for the 96-hour bioassay was 25 percent and the least observable effects concentration (LOEC) was 50 percent. Results on a daily basis are summarized in Table 4.

**Table 3**  
**StarKist Samoa and COS Samoa Packing**  
**Combined Effluent Bioassay Results**  
**May 2006 Supplementary Sampling**

Exposure Time	Parameter		
	LC <sub>50</sub>	NOEC	LOEC
24 hours	>50.4%	25%	50%
48 hours	>43.2%	25%	50%
72 hours	>42.7%	25%	50%
96 hours	>32.7%	12.5%	25%

**Table 4**  
**StarKist Samoa and COS Samoa Packing**  
**Combined Effluent Bioassay Results**  
**November 2006 Sampling**

Exposure Time	Parameter		
	LC <sub>50</sub>	NOEC	LOEC
24 hours	>55.1%	50%	75%
48 hours	>51.9%	50%	75%
72 hours	>50.5%	50%	75%
96 hours	>43.1%	25%	50%

### Discussion

Table 5 summarizes the results of the effluent bioassay tests for the samples collected in the May 2006 and November 2006 sampling compared to the previous bioassay tests. The LC<sub>50</sub>, NOEC, and LOEC are within the range obtained from

previous tests where *Americanopsis bahia* (*Mysidopsis bahia*) was used in place of *Penaeus vannami*. Figure 1 summarizes the LC<sub>50</sub> for the mysid and penaeid tests done since February 1993. Figure 2 presents the range of LC<sub>50</sub> results for mysids tests conducted since 1994. There is some variability observed in test results. The May 2006 test results are among the highest LC<sub>50</sub> values recorded for this organism, but because of the DO problems during the test results are lower than the results from the last 2½ years. During the November 2006 bioassay test the laboratory followed the correct protocol and the results was a test with one of the highest. Higher LC<sub>50</sub> values indicate lower whole effluent toxicity. There is a possible trend toward lower toxicity (higher LC<sub>50</sub>) with time (see Figure 2).

### Conclusions

The bioassay tests for the Joint Cannery Outfall effluent for May 2006 do not indicate effluent toxicity levels to be of concern. As discussed in the previous bioassay test reports on the effluent, the time scale of the mixing of the effluent with the receiving water is on the order of seconds to achieve dilutions that will eliminate possible toxic effects as reflected by the bioassay results. For example, an LC<sub>50</sub> of 32.7 percent after 96 hours of exposure, which was observed in May 2006, corresponds to a dilution factor of 3.1:1, which is achieved within one second and within one meter of the discharge point. The discharge is located in about 180 feet of water and the effluent toxicity tests indicate that the discharge is diluted to non-toxic levels immediately after discharge and well within the initial dilution plume.

For the May 2006 test the LC<sub>50</sub> of 32.7 percent corresponds to 3.06 acute toxicity units (TU<sub>a</sub>). A dilution of less than 10:1 will reduce the toxicity to less than 0.3 TU<sub>a</sub>, which is considered the acceptable level for the protection of aquatic life. The JCO achieves an initial dilution, under critical conditions of greater than 300:1. Therefore, at the edge of the zone of initial dilution (ZID) the acute toxicity is 1.02 TU<sub>a</sub> for the LC<sub>50</sub> documented in the May 2006 test. Since the test appears to be compromised by low DO depressions during the test the actual toxicity at the edge of the ZID is expected be even lower.

For the November 2006 test the LC<sub>50</sub> was 43.1 percent, which corresponds to a dilution factor of 2.3:1. This dilution is achieved within 1 second and within one meter of the discharge point. The November 2006 LC<sub>50</sub> of 43.1 percent corresponds to a TU<sub>a</sub> of 2.32, which is considered the acceptable level for the protection of aquatic life. The JCO achieves an initial dilution, under critical conditions of greater than 300:1. Therefore, at the edge of the zone of initial dilution (ZID) the acute toxicity is 0.77 TU<sub>a</sub> for the LC<sub>50</sub> documented in the November 2006 test.

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**Table 5**  
**StarKist Samoa and COS Samoa Packing**  
**Combined Effluent Bioassay Results**

Date	Species	Parameters		
		LC <sub>50</sub>	NOEC	LOEC
2/93	<i>Penaeus vannami</i>	4.8% <sup>1</sup>	3.1%	6.25%
10/93	<i>Penaeus vannami</i>	15.67%	3.1%	6.25%
2/94	<i>Penaeus vannami</i>	15.76%	<1.6%	1.6%
10/94	<i>Mysidopsis bahia</i> <sup>2</sup>	31.2%	25%	50%
3/95	<i>Penaeus vannami</i>	14.8%	6.25%	12.5%
3/95	<i>Mysidopsis bahia</i> <sup>3</sup>	10.8%	6.25%	12.5%
2/96	<i>Penaeus vannami</i>	>50%	>50%	>50%
2/96	<i>Mysidopsis bahia</i> <sup>3</sup>	28.36%	12.5%	25%
3/96	<i>Penaeus vannami</i>	44.4%	25%	50%
11/96	<i>Penaeus vannami</i>	7.11%	3.1%	6.25%
03/97	<i>Penaeus vannami</i>	39.36%	12.5%	25%
09/97	<i>Penaeus vannami</i> <sup>4</sup>	12.3%	6.25%	12.5%
06/98	<i>Mysidopsis bahia</i> <sup>2</sup>	17.2%	6.25%	12.5%
11/98	<i>Mysidopsis bahia</i> <sup>2</sup>	15%	6.25%	12.5%
02/00	<i>Mysidopsis bahia</i> <sup>2</sup>	20%	6.25%	12.5%
08/00	<i>Mysidopsis bahia</i> <sup>2</sup>	17.1%	3.1%	6.25%
03/01	<i>Americamysis bahia</i> <sup>2,5</sup>	13.8%	12.5%	25%
10/01	<i>Americamysis bahia</i> <sup>2,6</sup>	37.5%	25%	50%
3/02	<i>Americamysis bahia</i> <sup>2,6</sup>	16.1%	12.5%	25%
8/02	<i>Americamysis bahia</i> <sup>2,6</sup>	10.23%	6.25%	12.5%
03/03	<i>Americamysis bahia</i> <sup>2,6</sup>	28.4%	25%	50%
08/03	<i>Americamysis bahia</i> <sup>2,6</sup>	43.2%	25%	50%
02/04	<i>Americamysis bahia</i> <sup>2,6</sup>	>50%	50%	>50%
09/04	<i>Americamysis bahia</i> <sup>2,6</sup>	>50%	50%	>50%
03/05	<i>Americamysis bahia</i> <sup>2,6</sup>	48.5%	25%	50%
08/05	<i>Americamysis bahia</i> <sup>2,6</sup>	>50%	50%	>50%
03/06	<i>Americamysis bahia</i> <sup>2,6</sup>	35.6% <sup>7</sup>	25%	50%
05/06	<i>Americamysis bahia</i> <sup>2,6</sup>	32.7% <sup>7</sup>	12.5%	25%
11/06	<i>Americamysis bahia</i> <sup>2,6</sup>	43.1%	25%	50%

<sup>1</sup>The February 1993 samples were not aerated until after the first day of the test. For subsequent tests the samples were aerated for the entire duration of the tests.

<sup>2</sup>*Mysidopsis bahia* used as substitutes because *Penaeus vannami* not available: as directed and approved by USEPA.

<sup>3</sup>*Mysidopsis bahia* used in addition to *Penaeus vannami* as described in text of technical memorandums reporting test results. Only one species is required by the permit conditions.

<sup>4</sup>Stage 1 (3 mm) *Penaeus vannami* were used for testing because older Stage 7 and 8 (8-10 mm) *Penaeus vannami* were not available.

<sup>5</sup>*Mysidopsis bahia* renamed *Americamysis bahia*. Results indicate increased toxicity because of low DO in renewal concentrations as renewal water was not aerated prior to use

<sup>6</sup>*Mysidopsis bahia* renamed *Americamysis bahia*

<sup>7</sup>Results for this test depressed because aeration was not provided (see text).

Bioassay Testing – Joint Cannery Outfall Effluent  
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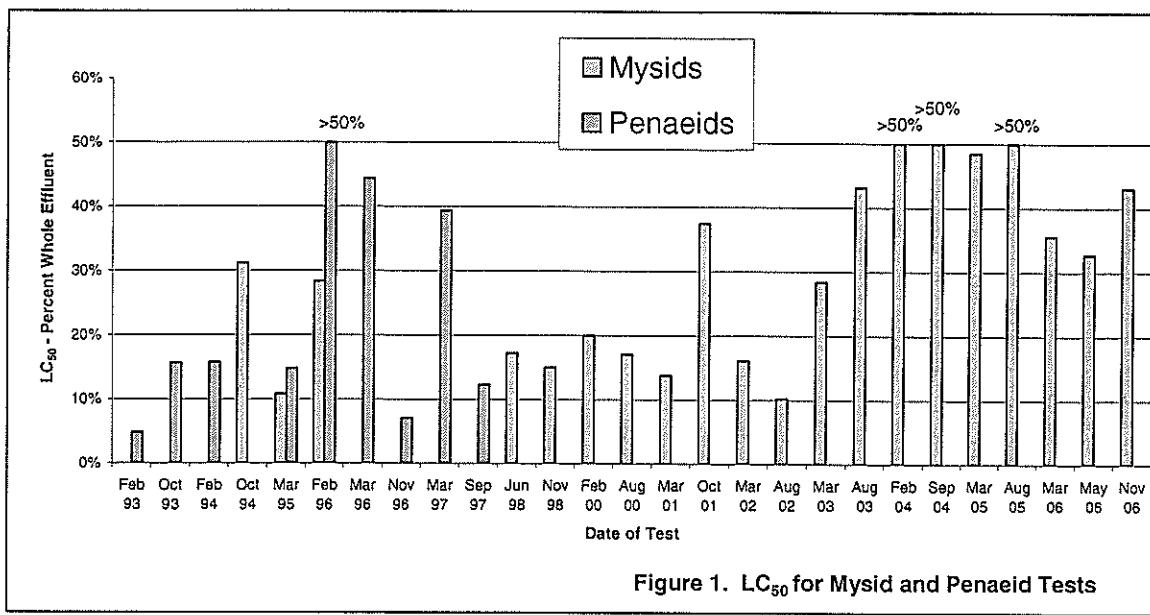


Figure 1.  $LC_{50}$  for Mysid and Penaeid Tests

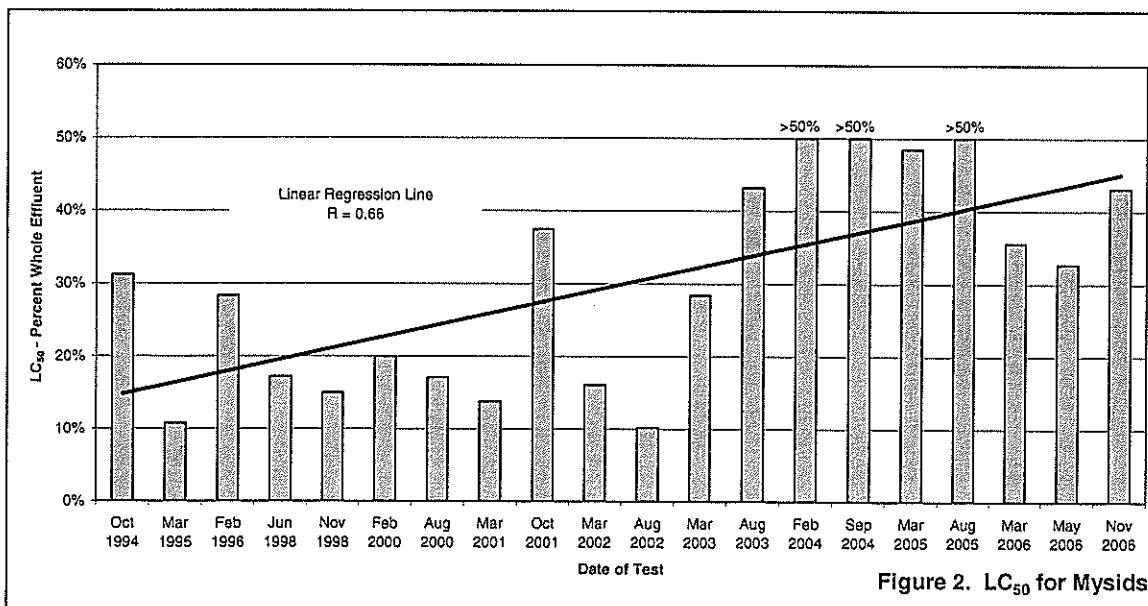


Figure 2.  $LC_{50}$  for Mysids

**ATTACHMENT I**

**Chain-of-Custody**

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Project Manager & Phone # Mr. [ ] <b>STEVE COSTA</b> Ms. [ ] Dr. [ ] <b>707-677-0123</b>		ANALYSES REQUESTED												Project									
Report Copy to:																							
Requested Completion Date:		Sampling Requirements				Sample Disposal:																NO. OF SAMPLES	
		<input type="checkbox"/> SDWA <input type="checkbox"/> NPDES <input type="checkbox"/> RCRA <input type="checkbox"/> OTHER				<input type="checkbox"/> Dispose <input type="checkbox"/> Return																Page No. 1 of 1	
Sampling		Type	Matrix		CLIENT SAMPLE ID (9 CHARACTERS)												Login						
Date	Time	C O R M A P	G R A B	W A T E R	S O I L	A I R													JMSWEN				
5/25/06	X	X		J	C	O	0	6	S	U	P	P	1	X	LAB 1 ID								
REMARKS														LAB 2 ID									
Sampled By & Title <i>Sh Costa</i> (Please sign and print name)														Date/Time <b>5/25/06</b>	Relinquished By <i>Sh Costa</i> (Please sign and print name)		Date/Time <b>5/25/06</b>	Received By <i>DHL</i> (Please sign and print name)		Date/Time <b>5/25/06</b>			
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Drop Box #	TOTAL

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**PAYMENT DETAILS (Check, Card No.)**

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 Type      Expires  
 Auth.

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Time *10:00* Date *5/13*

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CHAIN OF CUSTODY RECORD AND AGREEMENT TO PERFORM SERVICES

CH2M Hill Project # <b>1417323, JC. 06.TW</b>	Purchase Order # <b>PHONES</b>	# OF CONTAINERS	LAB TEST CODES						SHADED AREA-- FOR LAB USE ONLY						
Project Name <b>JOINT CANNERY OUTRALL</b>	Company Name/CH2M Hill Office <b>CH2M HILL</b>		PO BOX 1238	TRINIDAD, CA 95570					Lab 1#	Lab 2#					
Project Manager & Phone # Mr. [ ] <b>STEVE COSTA</b>	Report Copy to: <b>SAME</b>	Sampling Requirements	ANALYSES REQUESTED						Quote #	Kit Request #					
Ms. [ ] Dr. [ ] <b>707-677-0123</b>			SDWA NPOES RCRA OTHER	Dispose <input checked="" type="checkbox"/>	Return <input type="checkbox"/>					Project #					
Requested Completion Date:								No. of Samples	Page <b>1</b> of <b>1</b>						
								Login	LIMS Ver						
								REMARKS	LAB 1 ID	LAB 2 ID					
Sampling		Type	Matrix												
C O M P B	G R A M B	W A T E R	S O I L	A I R											
Date	Time	CLIENT SAMPLE ID (9 CHARACTERS)													
7-8 NOV 2006	X	X	JC0-06TW						1	X					
<i>Go-HR MySid ACUTE BIOASSAY</i>															
												<i>100-50-25-125 G-25-3-EPC</i>			
												<i>AS BEFORE</i>			
Sampled By & Title <i>SC Costa</i> (Please sign and print name)						Date/Time <b>7-8 Nov 06</b>	Relinquished By <i>SC Costa</i> (Please sign and print name)						Date/Time <b>9 Nov 06</b>	QC Level: 1 2 3 Other: <b>COC Rec</b> <input type="checkbox"/> <b>ICE</b> <input type="checkbox"/>	
Received By <i>SC Costa</i> (Please sign and print name)						Date/Time <b>11/06/06 1200</b>	Relinquished By (Please sign and print name)						Date/Time	<b>Ana Req.</b> <input type="checkbox"/> <b>TEMP</b> <input type="checkbox"/>	
Received By (Please sign and print name)						Date/Time	Relinquished By (Please sign and print name)						Date/Time	<b>Cust Seal</b> <input type="checkbox"/> <b>Ph</b> <input type="checkbox"/>	
Received By (Please sign and print name)						Date/Time	Shipped Via UPS <input type="checkbox"/> BUS <input type="checkbox"/> Fed-Ex <input type="checkbox"/> Hand <input type="checkbox"/> Other <i>DHL</i>						Shipping # <b>782-0788-4141</b>		
Work Authorized By (Please sign and print name)						Remarks <i>NOTE SOP FOR AERATION PROTOCOL</i>									

Instructions and Agreement Provisions on Reverse Side

DISTRIBUTION: Original - LAB, Yellow - LAB, Pink - Client  
REV 3/94 FORM 340



**ATTACHMENT II**

**EnviroSystems, Inc. Laboratory Report  
for May 2006 Supplementary Bioassay**

**TOXICOLOGICAL EVALUATION  
OF A TREATED EFFLUENT:  
BIOMONITORING SUPPORT FOR A NPDES PERMIT  
MAY 2006**

**American Samoa Joint Cannery Outfall**

Prepared For

CH2M Hill, Incorporated  
P.O. Box 1238  
Trinidad, California 95570-1238

By

EnviroSystems, Incorporated  
One Lafayette Road  
Hampton, New Hampshire 03842

May 2006  
Reference Number CH2M-Samoa14584-06-05

## **STUDY NUMBER 14584**

### **EXECUTIVE SUMMARY**

The following summarizes the results of acute exposure bioassays performed from May 31 to June 4, 2006 in support of the NPDES biomonitoring requirements of the American Samoa Joint Cannery Outfall. The 96 hour acute definitive assay was conducted using the marine species, *Americamysis bahia*.

#### **Acute Toxicity Evaluation**

Species	Exposure	LC-50	NOEC	LOEC
<i>Americamysis bahia</i>	24-Hours	50.4	25	50
	48-Hours	43.2	25	50
	72-Hours	42.7	25	50
	96-Hours	32.7	12.5	25

**TOXICOLOGICAL EVALUATION  
OF A TREATED EFFLUENT:  
BIOMONITORING SUPPORT FOR A NPDES PERMIT  
MAY 2006**

**American Samoa Joint Cannery Outfall**

## **1.0 INTRODUCTION**

This report presents the results of an acute toxicity test conducted on an effluent sample collected from the American Samoa Joint Cannery Outfall. Testing was based on programs and protocols developed by the US EPA (2002) and involved conducting 96 hour acute static renewal toxicity tests with the marine species, *Americamysis bahia*. Testing was performed at EnviroSystems, Incorporated (ESI), Hampton, New Hampshire in accordance with the provisions of the NELAC Standards (2000).

Acute toxicity tests involve preparing a series of concentrations by diluting effluent with control water. Groups of test organisms are exposed to each effluent concentration and a control for a specified period. In acute tests, mortality data for each concentration are used to calculate (by regression) the median lethal concentration, or LC-50, defined as the effluent concentration which kills half of the test organisms. Samples with high LC-50 values are less likely to cause significant environmental impact. The acute no observed effect concentration (NOEC) and lowest observed effect concentration (LOEC) document the highest and lowest effluent concentrations that have no impact and a significant impact on the test species, respectively.

## **2.0 MATERIALS AND METHODS**

### **2.1 General Methods**

Toxicological and analytical protocols used in this program follow procedures primarily designed by the EPA to provide standard approaches for the evaluation of toxicological effects of discharges on aquatic organisms, and for the analysis of water samples. See Section 4.0 for a list of references.

### **2.2 Test Species**

Every attempt was made to acquire the species, *Penaeus vannami*, as this is the preferred organism under the Cannery's permit. ESI was unable to obtain reasonably priced *P. vannami*. Due to the exorbitant expense, the decision was made to use an alternate species, *Americamysis bahia*.

*A. bahia*, <5 days old, were from cultures maintained at Aquatic Research Organisms. Test organisms were transferred to test chambers by large bore pipet, minimizing the amount of water added to test solutions.

### 2.3 Effluent and Dilution Water

The effluent sample used in the assay was identified as "JC006SUPP." Sample collection information is provided in Table 1. Upon receipt, the sample was stored at 4°C. All sample material used in the assay was warmed to 20±1°C prior to preparing test solutions.

Total residual chlorine (TRC) was measured using amperometric titration (MDL 0.05 mg/L). As the effluent sample contained <0.05 mg/L, TRC dechlorination with sodium thiosulfate was not required (EPA 2002).

Aliquots of the undiluted effluent sample were collected for ammonia analysis when the sample arrived and again prior to renewal. Upon arrival, the effluent sample had a salinity of 11.5‰. Salinity of the effluent was increased to 24.9‰ by the addition of artificial sea salts. Test concentrations for the assays were 100%, 75%, 50%, 25%, 12.5%, and 6.25% effluent with a laboratory water diluent control.

The dilution water used in this assay was collected from the sea water system at ESI. The water is pumped in daily from the Hampton Estuary on the flood tide, filtered through a high volume sand filter, and stored in 3000 gallon polyethylene tanks. The water is classified as Class SA-1 by the State of New Hampshire, and has been used to culture test organisms for over 20 years. Sea water used in the assay had a salinity of 25±2‰ and a TRC of <0.05 mg/L.

### 2.4 Acute Toxicity Tests

The 96 hour acute static renewal toxicity test was conducted at 20±2°C with a photoperiod of 16:8 hours light:dark. Test chambers for the acute assays were 250 mL glass beakers containing 200 mL test solution in each of 5 replicates, with 10 organisms/replicate. Survival, dissolved oxygen, pH, salinity and temperature were measured daily in all replicates. Test solutions were renewed after 48 hours using effluent from the start sample. Mysid shrimp were fed daily with <24 hour old brine shrimp.

### 2.5 Data Analysis

At 24 hour intervals, survival data was analyzed to assess toxicity using CETIS, Comprehensive Environmental Toxicity Testing System, software. The program computes acute exposure endpoints based on EPA decision tree guidelines specified in individual test methods. For acute exposure endpoints statistical significance was accepted at  $\alpha < 0.05$ .

### 2.6 Quality Control

As part of the laboratory quality control program, standard reference toxicant assays are conducted on a regular basis for each test species. These results provide relative health and response data while allowing for comparison with historic data sets. See Table 2 for details.

## **3.0 RESULTS**

Results of the acute exposure bioassay conducted using the mysid shrimp, *A. bahia*, are summarized in Tables 3A and 3B. Effluent and dilution water characteristics are presented in Table 4. Table 5 provides a summary of historic data associated with the discharge. Support data are included in Appendix A.

### **3.1 Acute Toxicity Test - *Americamysis bahia***

Minimum test acceptability criteria require ≥90% survival in the control concentration. As the laboratory water diluent control met or exceeded this protocol specification, results associated with the assay indicate that healthy test organisms were used in the study and that the dilution water had no adverse impact on the outcome of the assay. These data are considered as valid for evaluating impacts associated with the effluent sample.

Table 3 provides a summary of the acute exposure data and results.

### **3.2 Summary**

The salinity adjusted effluent sample collected from the American Samoa Joint Cannery Outfall exhibited significant signs of acute toxicity to the mysid shrimp, *Americamysis bahia*, during the 96 hour exposure period.

## **4.0 LITERATURE CITED**

- APHA. 1998. *Standard Methods for the Examination of Water and Wastewater*, 20<sup>th</sup> Edition. Washington D.C.
- National Environmental Laboratory Accreditation Conference: Quality Systems. Chapter 5. June 2000.
- Stephan, C. 1982. Documentation for Computing LC-50 Values with a Mini Computer. Unpublished.
- US EPA. 2002. *Attachment G: NPDES Whole Effluent Toxicity Testing, Monitoring and Reporting Tips and Common Pitfalls*. Dated December 2002. US EPA Region I Offices, Boston, Massachusetts.
- U.S. EPA. 2002. *Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms*. Fifth Edition. EPA-821-R-02-012.

**TABLE 1. Summary of Sample Collection Information.  
American Samoa Joint Cannery Outfall Effluent Evaluation. May 2006.**

Sample Description	Type	Collection Date	Collection Time	Receipt Date	Receipt Time	Arrival Temp °C
EFFLUENT	Comp	05/25/06	ND	05/31/06	1215	8*

\* Arrival temperature was outside of the range of  $4\pm 2^{\circ}\text{C}$  recommended by the protocol.

**TABLE 2. Summary of Reference Toxicant Data. American Samoa Joint Cannery Outfall Effluent Evaluation. May 2006.**

Date	Endpoint	Value	Historic Mean/ Central Tendency	Acceptable Range	Reference Toxicant
<i>A. bahia</i>					
05/30/06	Survival	LC-50	27.4	20.2	14.1 - 26.4 SDS (mg/L)

Means and Acceptable Ranges based on the most recent 20 reference toxicant assays

**TABLE 3A. Summary of Acute Evaluation Results. American Samoa Joint Cannery Outfall Effluent Evaluation. May 2006.**

Concentration % Effluent	Exposure	Replicates					Mean	Standard Deviation	Coefficient of Variation
		A	B	C	D	E			
Lab Control	Start	10	10	10	10	10	100%	0.000	0.00%
	24-Hours	10	10	10	10	10	100%	0.000	0.00%
	48-Hours	10	10	10	9	10	98%	0.045	4.56%
	72 Hours	10	10	10	9	10	98%	0.045	4.56%
	96-Hours	10	10	10	9	9	96%	0.055	5.71%
6.25%	24-Hours	10	10	10	10	10	100%	0.000	0.00%
	48-Hours	10	10	10	10	9	98%	0.045	4.56%
	72 Hours	10	10	10	10	9	98%	0.045	4.56%
	96-Hours	10	9	10	10	9	96%	0.055	5.71%
12.5%	24-Hours	10	9	10	10	10	98%	0.045	4.56%
	48-Hours	10	9	10	10	10	98%	0.045	4.56%
	72 Hours	10	9	10	10	10	98%	0.045	4.56%
	96-Hours	10	9	9	9	10	94%	0.055	5.83%
25%	24-Hours	9	10	8	10	3	80%	0.292	36.45%
	48-Hours	7	10	4	10	3	68%	0.327	48.10%
	72 Hours	7	10	4	10	3	68%	0.327	48.10%
	96-Hours	7	9	4	6	3	58%	0.239	41.17%
50%	24-Hours	8	1	2	2	5	36%	0.288	80.03%
	48-Hours	7	1	2	2	5	34%	0.251	73.82%
	72 Hours	7	1	2	2	5	34%	0.251	73.82%
	96-Hours	6	1	2	3	4	32%	0.192	60.13%
75%	24-Hours	10	5	0	10	1	52%	0.477	91.63%
	48-Hours	6	5	0	10	0	42%	0.427	101.57%
	72 Hours	6	5	0	10	0	42%	0.427	101.57%
	96-Hours	4	0	0	0	0	8%	0.179	223.63%
100%	24-Hours	7	0	0	7	5	38%	0.356	93.79%
	48-Hours	6	0	0	5	1	24%	0.288	120.04%
	72 Hours	0	0	5	1	12%	0.238	198.42%	
	96-Hours	0	0	0	0	0	0%	0.000	0.00%

**TABLE 3B. Summary of Acute Evaluation Results. American Samoa Joint Cannery Outfall Effluent Evaluation. May 2006.**

Exposure Period	SUMMARY OF ENDPOINTS		NOEC	LOEC
	LC-50 (95% Limits)	METHOD		
24 Hours	50.4% (35.5-71.5)	Trimmed Spearman-Karber	25%	50%
48 Hours	43.2% (34.8-53.6)	Trimmed Spearman-Karber	25%	50%
72 Hours	42.7% (35.9-50.8)	Trimmed Spearman-Karber Direct Observation	25%	50%
96 Hours	32.7% (28.8-37.2)	Trimmed Spearman-Karber Direct Observation	12.5%	25%

**TABLE 4. Summary of Effluent and Diluent Characteristics. American Samoa Joint Cannery Outfall Effluent Evaluation. May 2006.**

PARAMETER	UNITS	100% EFFLUENT	50% EFFLUENT	DILUENT
Salinity - As Received	‰	11.5	-	25
Salinity - After Salinity Adjustment	‰	24.9	25	-
pH - As Received	SU	6.55	-	7.33
pH - After Salinity Adjustment	SU	7.03	7.35	-
TRC - As Received	mg/L	<0.05	-	<0.05
Dissolved Oxygen - As Received	mg/L	1.7	-	5.7
Dissolved Oxygen - After Aeration	mg/L	6.2	6.0	-
Ammonia - As Received	mg/L as N	24	-	0.23
Unionized Ammonia - As Received	mg/L as N	0.101	-	0.002
Ammonia - Salinity Adjusted	mg/L as N	-	12	-
Unionized Ammonia - Salinity Adjusted	mg/L as N	-	0.105	-
Ammonia - at 48 Hours	mg/L as N	20	13	<0.1
Unionized Ammonia - at 48 Hours	mg/L as N	0.192	0.221	<0.004

**TABLE 5. Summary of StarKist Samoa and COS Samoa Packing Combined Effluent Bioassay Results. American Samoa Joint Cannery Outfall Effluent Evaluation. May 2006.**

Date	Species	96-Hour Endpoints		
		LC-50	NOEC	LOEC
02/93 <sup>1</sup>	<i>Penaeus vannami</i>	4.8%	3.1%	6.25%
10/93 <sup>1</sup>	<i>Penaeus vannami</i>	15.67%	3.1%	6.25%
02/94 <sup>1</sup>	<i>Penaeus vannami</i>	15.76%	<1.6%	1.6%
10/94 <sup>1</sup>	<i>Americamysis bahia</i>	31.2%	25.0%	50.0%
03/95 <sup>1</sup>	<i>Penaeus vannami</i>	14.8%	6.25%	12.5%
03/95 <sup>1</sup>	<i>Americamysis bahia</i>	10.8%	6.25%	12.5%
02/96 <sup>1</sup>	<i>Penaeus vannami</i>	>50.0%	>50.0%	>50.0%
03/96 <sup>1</sup>	<i>Penaeus vannami</i>	44.4%	25.0%	50.0%
11/96 <sup>1</sup>	<i>Penaeus vannami</i>	7.11%	3.1%	6.25%
03/97 <sup>1</sup>	<i>Penaeus vannami</i>	39.36%	12.5%	25.0%
09/97 <sup>1</sup>	<i>Penaeus vannami</i>	12.3%	6.25%	12.5%
06/98 <sup>1</sup>	<i>Americamysis bahia</i>	17.2%	6.25%	12.5%
11/98 <sup>1</sup>	<i>Americamysis bahia</i>	15.0%	6.25%	12.5%
02/00 <sup>1</sup>	<i>Americamysis bahia</i>	20.0%	6.25%	12.5%
08/00 <sup>1</sup>	<i>Americamysis bahia</i>	17.1%	3.1%	6.25%
03/01 <sup>2</sup>	<i>Americamysis bahia</i>	13.81%	12.5%	25.0%
03/02 <sup>2</sup>	<i>Americamysis bahia</i>	16.13%	12.5%	25.0%
08/02 <sup>2</sup>	<i>Americamysis bahia</i>	10.23%	6.25%	12.5%
03/03 <sup>2</sup>	<i>Americamysis bahia</i>	28.4%	25.0%	50.0%
08/03 <sup>2</sup>	<i>Americamysis bahia</i>	43.2%	25.0%	50.0%
03/04 <sup>2</sup>	<i>Americamysis bahia</i>	>50.0%	50.0%	>50.0%
10/04 <sup>2</sup>	<i>Americamysis bahia</i>	>50.0%	50.0%	>50.0%
03/05 <sup>2</sup>	<i>Americamysis bahia</i>	48.5%	25.0%	50.0%
10/05 <sup>2</sup>	<i>Americamysis bahia</i>	>50.0%	50.0%	>50.0%
03/06 <sup>2</sup>	<i>Americamysis bahia</i>	35.6%	25.0%	50.0%
05/06 <sup>2</sup>	<i>Americamysis bahia</i>	32.7%	12.5%	25.0%

Notes:

<sup>1</sup>. Assays conducted by Advanced Biological Testing, Inc., Rohnert Park, California

<sup>2</sup>. Assays conducted by EnviroSystems, Inc., Hampton, New Hampshire

**APPENDIX A**  
**DATA SHEETS**  
**STATISTICAL SUPPORT**

Contents	Number of Pages
Methods Used in NPDES Permit Biomonitoring Testing	1
<i>A. bahia</i> Acute Bioassay Data Summary	3
<i>A. bahia</i> Survival Statistics: LC-50, NOEC	16
<i>A. bahia</i> Organism Culture Sheet	1
Effluent & Diluent Chemistry and Water Quality Data	1
Record of Meters Used for Water Quality Measurements	1
Analytical Chemistry Summary	3
Unionized Ammonia Calculation	1
Sample Receipt Record	1
Chain of Custody	1

## METHODS USED IN NPDES PERMIT BIOMONITORING TESTING

<b>Parameter</b>	<b>Method</b>
<b>Acute Exposure Bioassays</b>	
<i>Ceriodaphnia dubia, Daphnia pulex</i>	EPA-821-R-02-012
<i>Pimephales promelas</i>	EPA-821-R-02-012
<i>Americamysis bahia</i>	EPA-821-R-02-012
<i>Menidia beryllina, Cyprinodon variegatus</i>	EPA-821-R-02-012
<b>Chronic Exposure Bioassays</b>	
<i>Ceriodaphnia dubia</i>	EPA-821-R-02-013, 1002.0
<i>Pimephales promelas</i>	EPA-821-R-02-013, 1000.0
<i>Cyprinodon variegatus</i>	EPA-821-R-02-014, 1004.0
<i>Menidia beryllina</i>	EPA-821-R-02-014, 1006.0
<i>Arbacia punctulata</i>	EPA-821-R-02-014, 1008.0
<i>Champia parvula</i>	EPA-821-R-02-014, 1009.0
<b>Trace Metals:</b>	
ICP Metals	EPA 200.7/SW 6010
Hardness	Standard Methods 20 <sup>th</sup> Edition - Method 2340 B
<b>Wet Chemistries:</b>	
Alkalinity	EPA 310.2
Chlorine, Residual	Standard Methods 20 <sup>th</sup> Edition - Method 4500CLD
Total Organic Carbon	Standard Methods 20 <sup>th</sup> Edition - Method 5310C
Specific Conductance	Standard Methods 20 <sup>th</sup> Edition - Method 2510B
Nitrogen - Ammonia	Standard Methods 20 <sup>th</sup> Edition - Method 4500NH3G
pH	Standard Methods 20 <sup>th</sup> Edition - Method 4500H+B
Solids, Total (TS)	Standard Methods 20 <sup>th</sup> Edition - Method 2540.B
Solids, Total Suspended (TSS)	Standard Methods 20 <sup>th</sup> Edition - Method 2540D
Dissolved Oxygen	Standard Methods 20 <sup>th</sup> Edition - Method 4500-O G

# ACUTE BIOASSAY DATA SUMMARY

STUDY: 14584										"AS RECEIVED" EFFLUENT AND DILUENT CHEMISTRIES																				
CLIENT: CH2M Hill		TEST ORGANISM: <i>A. bahia</i>								TRC	AMM 0 HR*	AMM 48 HR*	pH	DO	Salinity															
SAMPLE: American Samoa		ORGANISM SUPPLIER/BATCH/AGE: <i>See Organism Culture Sheet</i>								EFFLUENT	See "EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA" sheet																			
DILUENT: LAB SALT										DILUENT																				
SALINITY ADJUSTMENT RECORD (IF APPLICABLE): 10,000 ML EFFLUENT + 156 G SEA SALTS = 100% ACTUAL PERCENTAGE																														
CONC	REP	SURVIVAL					♦DISSOLVED OXYGEN (MG/L)♦							PH (SU)					TEMPERATURE (°C)					SALINITY (ppt)						
		0	24	48	72	96	0	24	480	48☆	72	96	0	24	480	48☆	72	96	0	24	480	48	72	96	0	24	480	48	72	96
LAB	A	10	10	10	10	10	5.3	7.8	7.0	6.5	7.2	7.6	7.3	7.88	7.94	7.91	7.92	7.93	21	19	19	21	21	19	24	25	25	25	25	26
	B	10	10	10	10	10	5.7	7.8	7.8	7.3	7.2	7.6	7.3	7.74	7.95	7.97	7.95	7.94	21	19	19	21	21	19	25	25	26	25	25	26
	C	10	10	10	10	10	5.4	7.9	7.8	7.3	7.3	7.7	7.3	7.93	7.94	7.99	7.95	7.95	21	19	19	21	21	19	25	25	26	25	25	26
	D	10	10	9	9	9	5.3	8.0	7.9	7.2	7.3	7.7	7.3	7.94	7.94	7.97	7.95	7.94	21	19	19	21	21	19	25	25	26	25	25	26
	E	10	10	10	10	9	5.5	7.9	7.9	7.2	7.3	7.7	7.3	7.95	7.95	7.99	7.95	7.94	21	19	19	21	21	19	25	26	26	25	25	26
6.25%	A	10	10	10	16	10	6.0	7.9	7.9	6.8	6.9	7.5	7.3	7.86	7.96	7.95	7.87	7.87	21	19	19	21	21	19	25	25	26	25	25	26
	B	10	10	10	10	9	6.2	7.9	7.8	6.8	6.7	7.6	7.3	7.93	7.94	7.93	7.95	7.96	21	19	19	21	21	19	25	25	26	25	25	26
	C	10	10	10	10	10	6.4	7.8	7.8	6.8	6.7	7.6	7.3	7.96	7.96	7.93	7.95	7.96	21	19	19	21	21	19	25	25	26	25	25	26
	D	10	10	10	16	10	6.3	7.9	7.8	6.8	6.7	7.6	7.3	7.93	7.93	7.97	7.96	7.97	21	19	19	21	21	19	25	25	26	25	25	26
	E	10	10	9	9	9	6.4	7.9	7.9	6.5	6.6	7.7	7.4	7.96	7.96	7.97	7.96	7.97	21	19	19	21	21	19	25	26	26	25	25	26
DATE		5/31	6/1	6/2	6/3	6/4	5/31	6/1	6/2	6/2	6/3	6/4																		
TIME		1505	1320	1355	1320	1335	1415	1315	1335	1450	1310	1325																		
INITIALS		EG	EG	EG	YH	SJ	EG	EG	EG	EG	EG	YH																		
FED?																														

\* - See: "EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA" sheet.

♦ - AERATE FROM START!

◊ - "Old" water qualities (prior to renewal)

☆ - "New" water qualities (post renewal)

STUDY: 14584		SAMPLE RECEIVED:								"AS RECEIVED" EFFLUENT AND DILUENT CHEMISTRIES																					
CLIENT: CH2M Hill		TEST ORGANISM: A. bahia										TRC	AMM 0 HR*		AMM 48 HR*		pH	DO	Salinity												
SAMPLE: American Samoa		ORGANISM SUPPLIER:								EFFLUENT		See "EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA" sheet																			
DILUENT: LAB SALT		ORGANISM BATCH/AGE:								DILUENT																					
CONC	REP	SURVIVAL					♦ DISSOLVED OXYGEN (MG/L)♦								PH (SU)					TEMPERATURE (°C)					SALINITY (ppt)						
		0	24	48	72	96	0	24	480	48☆	72	96	0	24	480	48☆	72	96	0	24	480	48	72	96	0	24	480	48	72	96	
12.5%	A	10	10	10	10	10	5.9	7.9	7.5	6.0	6.1	7.5	7.31	7.96	7.96	7.81	7.90	7.98	21	19	19	21	21	21	25	25	26	25	25	25	
	B	10	9	9	9	9	6.0	7.7	7.6	6.0	6.1	7.6	7.35	7.91	7.94	7.88	7.89	7.97	21	19	19	21	21	21	25	25	26	25	25	25	
	C	10	10	10	10	9	6.1	7.8	7.6	6.2	6.1	7.6	7.39	7.96	7.96	7.88	7.87	7.99	21	19	19	21	21	21	25	25	26	25	25	25	
	D	10	10	10	10	9	6.2	7.7	7.6	6.3	6.2	7.6	7.36	7.94	7.96	7.88	7.88	7.96	21	19	19	21	21	21	25	25	26	25	25	25	
	E	10	10	10	10	10	6.3	7.8	7.7	6.0	6.1	7.5	7.37	7.97	8.00	7.89	7.88	7.96	21	19	19	21	21	21	25	26	26	25	25	25	
25%	A	10	9	7	7	7	5.8	7.1	5.3	6.2	6.1	7.5	7.28	7.93	7.72	7.75	7.76	8.13	21	19	19	21	21	19	25	25	26	25	25	26	
	B	10	10	10	10	9	6.1	7.3	7.0	4.9	5.6	7.4	7.27	7.94	8.03	7.78	7.76	8.13	21	19	19	21	21	19	25	25	26	25	25	26	
	C	10	8	4	4	4	6.0	7.4	7.3	4.8	4.9	7.4	7.27	7.91	8.04	7.78	7.74	8.12	21	19	19	21	21	19	25	25	26	25	25	26	
	D	10	10	10	10	6	6.1	7.6	7.0	4.9	4.8	4.6	7.27	7.96	7.93	7.75	7.75	8.10	21	19	19	21	21	19	25	25	26	25	25	26	
	E	10	3	3	3	3	6.0	7.5	4.6	4.3	4.3	6.8	7.28	7.90	7.70	7.71	7.72	8.10	21	19	19	21	21	19	25	25	26	25	25	26	
50%	A	10	8	7	7	6	5.4	7.0	7.0	2.5	2.5	7.1	7.20	7.90	8.10	7.64	7.63	8.15	21	19	19	21	21	19	25	25	26	25	25	26	
	B	10	1	1	1	1	5.5	6.4	7.4	2.7	2.7	4.6	7.20	7.91	8.15	7.64	7.63	8.15	21	19	19	21	21	19	25	25	26	25	25	26	
	C	10	2	2	2	2	5.7	6.7	7.5	2.9	2.9	3.4	7.21	7.91	8.14	7.64	7.63	8.15	21	19	19	21	21	19	25	25	26	25	25	26	
	D	10	2	2	2	3	5.5	6.9	7.3	2.9	2.9	6.7	7.21	7.91	8.15	7.63	7.63	8.14	21	19	19	21	21	19	25	25	26	25	25	26	
	E	10	5	5	5	4	5.8	6.9	7.5	2.6	2.6	7.0	7.22	8.03	8.13	7.64	7.61	8.11	21	19	19	21	21	19	25	25	26	25	25	26	
DATE	5/31	6/1	6/2	6/3	6/4	5/31	6/1	6/2	6/2	6/3	6/4																				
TIME	1305	1335	1410	1325	1355	1420	1310	1335	1555	1315	1325																				
INITIALS	GB	EG	EG	YH	SJ	EG	EG	EG	EG	EG	YH																				
FED?																															

\* - See: "EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA" sheet.

◆ - AERATE FROM START!

◊ - "Old" water qualities (prior to renewal)

☆ - "New" water qualities (post renewal)

# ACUTE BIOASSAY DATA SUMMARY

STUDY: 14584		SAMPLE RECEIVED:					"AS RECEIVED" EFFLUENT AND DILUENT CHEMISTRIES																							
CLIENT: CH2M Hill		TEST ORGANISM: A. bahia						TRC	AMM 0 HR*	AMM 48 HR*	pH	DO	Salinity																	
SAMPLE: American Samoa		ORGANISM SUPPLIER:					EFFLUENT	See "EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA" sheet																						
DILUENT: LAB SALT		ORGANISM BATCH/AGE:					DILUENT																							
CONC	REP	SURVIVAL					♦DISSOLVED OXYGEN (MG/L)♦						PH (SU)					TEMPERATURE (°C)					SALINITY (ppt)							
		0	24	48	72	96	0	24	48*	48*	72	96	0	24	48*	48*	72	96	0	24	48*	48*	72	96	0	24	48*	48	72	96
75%	A	10	10	6	6	4	5.2	6.0	7.0	0.5	0.5	7.1	7.16	7.94	8.07	7.50	7.51	8.19	21	19	19	21	21	19	25	25	26	25	25	26
	B	10	5	5	5	0	5.1	6.2	7.3	0.5	0.5	7.0	7.17	7.82	8.17	7.52	5.52	8.19	21	19	19	21	21	19	25	25	26	26	25	26
	C	10	Ø	—	—	—	5.1	2.3	—	—	—	7.14	7.67	—	—	—	—	—	21	19	—	—	—	—	25	25	—	—	—	—
	D	10	10	10	10	0	5.3	5.5	7.3	0.5	0.5	6.3	7.15	7.89	8.18	7.50	7.50	8.05	21	19	19	21	21	19	25	25	26	25	25	26
	E	10	1	Ø	—	—	5.0	5.8	7.3	—	—	7.14	7.64	8.16	—	—	—	—	21	19	19	—	—	—	25	25	26	—	—	—
100%	A	10	7	6	0	0	5.3	5.5	7.2	0.5	0.5	6.8	7.03	7.94	8.17	7.39	7.40	8.19	21	19	19	20	21	—	19	25	25	26	25	26
	B	10	Ø	—	—	—	4.7	4.1	—	—	—	7.04	7.83	—	—	—	—	—	21	20	—	—	—	—	25	25	—	—	—	—
	C	10	Ø	—	—	—	5.0	5.2	—	—	—	7.04	7.77	—	—	—	—	—	21	20	—	—	—	—	25	25	—	—	—	—
	D	10	7	5	5	0	5.1	5.5	6.0	0.5	0.5	6.9	7.03	7.94	8.03	7.30	7.40	8.24	21	20	20	21	21	19	25	25	26	25	25	26
	E	10	5	1	1	0	5.0	3.2	6.9	0.5	0.5	6.7	7.03	7.89	8.21	7.35	7.37	8.10	21	20	20	21	21	19	25	26	26	25	25	26
DATE		5/31	6/1	6/2	6/3	6/4	5/31	6/1	6/2	6/3	6/4																			
TIME		15:00	13:45	14:15	13:25	13:35	14:30	03:15	13:40	15:55	13:20	13:25																		
INITIALS		EG	EG	EG	AC	SJ	EG	EG	EG	EG	EG	LP	SJ																	
FED?																														

\* - See: "EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA" sheet.

♦ - AERATE FROM START!

◊ - "Old" water qualities (prior to renewal)

☆ - "New" water qualities (post renewal)

## CETIS Test Summary

Americamysis 96-h Acute Survival Test					EnviroSystems, Inc.	
Test No:	16-7688-1623	Test Type:	Survival (96h)	Duration:	94h	
Start Date:	31 May-06 03:05 PM	Protocol:	EPA/821/R-02-012 (2002)	Species:	Americamysis bahia	
Ending Date:	04 Jun-06 01:35 PM	Dil Water:	Natural Seawater	Source:	ARO - Aquatic Research Organisms, N	
Setup Date:	31 May-06 03:05 PM	Brine:	Generic commercial salts			
Sample No:	04-7158-0505	Material:	Industrial Effluent	Client:	CH2M Hill	
Sample Date:	25 May-06	Code:	14584	Project:	WET Quarterly Compliance Test (2Q)	
Receive Date:	31 May-06 12:15 PM	Source:	CH2M Hill- American Samoa			
Sample Age:	6d 15h (8 °C)	Station:	Joint Cannery Outfall			
<b>Comparison Summary</b>						
Analysis	Endpoint	NOEL	LOEL	ChV	MSDp	Method
03-5803-5512	24h Proportion Survived	25	50	35.355	37.45%	Steel's Many-One Rank
11-4142-6689	48h Proportion Survived	25	50	35.355	35.89%	Steel's Many-One Rank
06-5810-1487	72h Proportion Survived	25	50	35.355	40.24%	Bonferroni Adj Wilcoxon Rank Sum
10-1522-2120	96h Proportion Survived	12.5	25	17.678	19.15%	Dunnett's Multiple Comparison
<b>Point Estimate Summary</b>						
Analysis	Endpoint	% Effect	Conc-%	95% LCL	95% UCL	Method
15-8458-6845	24h Proportion Survived	50	50.36943	35.47959	71.50814	Trimmed Spearman-Karber
05-8376-2064	48h Proportion Survived	50	43.22371	34.84295	53.62029	Trimmed Spearman-Karber
10-8629-6499	72h Proportion Survived	50	42.68265	35.87596	50.78076	Trimmed Spearman-Karber
09-2364-4726	96h Proportion Survived	50	32.74078	28.84212	37.16642	Trimmed Spearman-Karber
<b>Test Acceptability</b>						
Analysis	Endpoint	Attribute	Statistic	Acceptable Range	Decision	
09-2364-4726	96h Proportion Survived	Control Response	0.96	0.9 - N/A	Passes acceptability criteria	
10-1522-2120	96h Proportion Survived	Control Response	0.96	0.9 - N/A	Passes acceptability criteria	

## CETIS Test Summary

## 24h Proportion Survived Summary

Conc-%	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Lab Water	5	1.00000	1.00000	1.00000	0.00000	0.00000	0.00%
6.25		5	1.00000	1.00000	1.00000	0.00000	0.00000	0.00%
12.5		5	0.98000	0.90000	1.00000	0.02000	0.04472	4.56%
25		5	0.80000	0.30000	1.00000	0.13038	0.29155	36.44%
50		5	0.36000	0.10000	0.80000	0.12884	0.28810	80.03%
75		5	0.52000	0.00000	1.00000	0.21307	0.47645	91.62%
100		5	0.38000	0.00000	0.70000	0.15937	0.35637	93.78%

## 48h Proportion Survived Summary

Conc-%	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Lab Water	5	0.98000	0.90000	1.00000	0.02000	0.04472	4.56%
6.25		5	0.98000	0.90000	1.00000	0.02000	0.04472	4.56%
12.5		5	0.98000	0.90000	1.00000	0.02000	0.04472	4.56%
25		5	0.68000	0.30000	1.00000	0.14629	0.32711	48.10%
50		5	0.34000	0.10000	0.70000	0.11225	0.25100	73.82%
75		5	0.42000	0.00000	1.00000	0.19079	0.42661	101.57
100		5	0.24000	0.00000	0.60000	0.12884	0.28810	120.04

## 72h Proportion Survived Summary

Conc-%	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Lab Water	5	0.98000	0.90000	1.00000	0.02000	0.04472	4.56%
6.25		5	0.98000	0.90000	1.00000	0.02000	0.04472	4.56%
12.5		5	0.98000	0.90000	1.00000	0.02000	0.04472	4.56%
25		5	0.68000	0.30000	1.00000	0.14629	0.32711	48.10%
50		5	0.34000	0.10000	0.70000	0.11225	0.25100	73.82%
75		5	0.42000	0.00000	1.00000	0.19079	0.42661	101.57
100		5	0.15000	0.00000	0.50000	0.11902	0.23805	158.70

## 96h Proportion Survived Summary

Conc-%	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Lab Water	5	0.96000	0.90000	1.00000	0.02449	0.05477	5.71%
6.25		5	0.96000	0.90000	1.00000	0.02449	0.05477	5.71%
12.5		5	0.94000	0.90000	1.00000	0.02449	0.05477	5.83%
25		5	0.58000	0.30000	0.90000	0.10677	0.23875	41.16%
50		5	0.32000	0.10000	0.60000	0.08602	0.19235	60.11%
75		5	0.08000	0.00000	0.40000	0.08000	0.17889	223.61
100		5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00%

## CETIS Test Summary

## 24h Proportion Survived Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
0	Lab Water	1.00000	1.00000	1.00000	1.00000	1.00000
6.25		1.00000	1.00000	1.00000	1.00000	1.00000
12.5		1.00000	0.90000	1.00000	1.00000	1.00000
25		0.90000	1.00000	0.80000	1.00000	0.30000
50		0.80000	0.10000	0.20000	0.20000	0.50000
75		1.00000	0.50000	0.00000	1.00000	0.10000
100		0.70000	0.00000	0.00000	0.70000	0.50000

## 48h Proportion Survived Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
0	Lab Water	1.00000	1.00000	1.00000	0.90000	1.00000
6.25		1.00000	1.00000	1.00000	1.00000	0.90000
12.5		1.00000	0.90000	1.00000	1.00000	1.00000
25		0.70000	1.00000	0.40000	1.00000	0.30000
50		0.70000	0.10000	0.20000	0.20000	0.50000
75		0.60000	0.50000	0.00000	1.00000	0.00000
100		0.60000	0.00000	0.00000	0.50000	0.10000

## 72h Proportion Survived Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
0	Lab Water	1.00000	1.00000	1.00000	0.90000	1.00000
6.25		1.00000	1.00000	1.00000	1.00000	0.90000
12.5		1.00000	0.90000	1.00000	1.00000	1.00000
25		0.70000	1.00000	0.40000	1.00000	0.30000
50		0.70000	0.10000	0.20000	0.20000	0.50000
75		0.60000	0.50000	0.00000	1.00000	0.00000
100		N/A	0.00000	0.00000	0.50000	0.10000

## 96h Proportion Survived Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
0	Lab Water	1.00000	1.00000	1.00000	0.90000	0.90000
6.25		1.00000	0.90000	1.00000	1.00000	0.90000
12.5		1.00000	0.90000	0.90000	0.90000	1.00000
25		0.70000	0.90000	0.40000	0.60000	0.30000
50		0.60000	0.10000	0.20000	0.30000	0.40000
75		0.40000	0.00000	0.00000	0.00000	0.00000
100		0.00000	0.00000	0.00000	0.00000	0.00000

# CETIS Analysis Detail

Americamysis 96-h Acute Survival Test							EnviroSystems, Inc.							
Test No:	16-7688-1623	Test Type:	Survival (96h)				Duration:	94h						
Start Date:	31 May-06 03:05 PM	Protocol:	EPA/821/R-02-012 (2002)				Species:	Americamysis bahia						
Ending Date:	04 Jun-06 01:35 PM	Dil Water:	Natural Seawater				Source:	ARO - Aquatic Research Organisms, N						
Setup Date:	31 May-06 03:05 PM	Brine:	Generic commercial salts											
Sample No:	04-7158-0505	Material:	Industrial Effluent				Client:	CH2M Hill						
Sample Date:	25 May-06	Code:	14584				Project:	WET Quarterly Compliance Test (2Q)						
Receive Date:	31 May-06 12:15 PM	Source:	CH2M Hill- American Samoa											
Sample Age:	6d 15h (8 °C)	Station:	Joint Cannery Outfall											
Endpoint	Analysis Type			Sample Link	Control Link	Date Analyzed	Version							
24h Proportion Survived	Comparison			12-0159-0837	12-0159-0837	18 Jul-06 4:28 PM	CETISv1.026							
Method	Alt H	Data Transform			Z	NOEL	LOEL	Toxic Units	ChV	MSDp				
Steel's Many-One Rank	C > T	Angular (Corrected)				25	50	4.00	35.355	37.45%				
ANOVA Assumptions														
Attribute	Test	Statistic			Critical	P Level	Decision(0.01)							
Variances	Modified Levene	11.02057			3.52756	0.00000	Unequal Variances							
Distribution	Shapiro-Wilk W	0.93156			0.91004	0.04285	Normal Distribution							
ANOVA Table														
Source	Sum of Squares		Mean Square	DF	F Statistic	P Level	Decision(0.05)							
Between	3.997188		0.6661979	6	6.19	0.00032	Significant Effect							
Error	3.013542		0.1076265	28										
Total	7.01072931		0.7738244	34										
Group Comparisons														
Control	vs	Conc-%	Statistic	Critical	P Level	Ties	Decision(0.05)							
Lab Water		6.25	27.5	16	> 0.0500	1	Non-Significant Effect							
		12.5	25	16	> 0.0500	1	Non-Significant Effect							
		25	20	16	> 0.0500	1	Non-Significant Effect							
		50	15	16	<= 0.0500	2	Significant Effect							
		75	20	16	> 0.0500	1	Non-Significant Effect							
		100	15	16	<= 0.0500	3	Significant Effect							
Data Summary														
Original Data			Transformed Data											
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD				
0	Lab Water	5	1.00000	1.00000	1.00000	0.00000	1.41202	1.41202	1.41202	0.00026				
6.25		5	1.00000	1.00000	1.00000	0.00000	1.41202	1.41202	1.41202	0.00026				
12.5		5	0.98000	0.90000	1.00000	0.04472	1.37942	1.24905	1.41202	0.07288				
25		5	0.80000	0.30000	1.00000	0.29155	1.15197	0.57964	1.41202	0.34433				
50		5	0.36000	0.10000	0.80000	0.28810	0.62832	0.32175	1.10715	0.31708				
75		5	0.52000	0.00000	1.00000	0.47645	0.81799	0.15878	1.41202	0.58898				
100		5	0.38000	0.00000	0.70000	0.35637	0.61705	0.15878	0.99116	0.42670				
Data Detail														
Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10			
0	Lab Water	1.00000	1.00000	1.00000	1.00000	1.00000								
6.25		1.00000	1.00000	1.00000	1.00000	1.00000								
12.5		1.00000	0.90000	1.00000	1.00000	1.00000								
25		0.90000	1.00000	0.80000	1.00000	0.30000								
50		0.80000	0.10000	0.20000	0.20000	0.50000								
75		1.00000	0.50000	0.00000	1.00000	0.10000								
100		0.70000	0.00000	0.00000	0.70000	0.50000								

# CETIS Analysis Detail

Comparisons:

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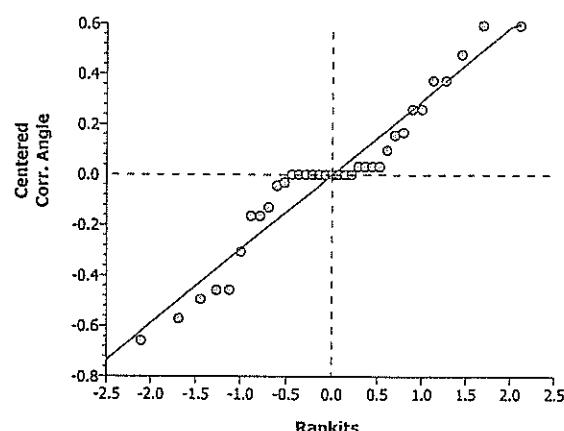
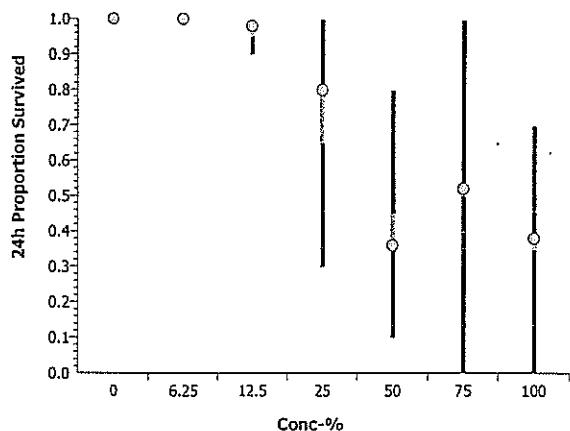
Report Date:

18 Jul-06 4:30 PM

Analysis:

03-5803-5512

## Graphics



# CETIS Analysis Detail

Americamysis 96-h Acute Survival Test							EnviroSystems, Inc.							
Test No:	16-7688-1623	Test Type:	Survival (96h)				Duration:	94h						
Start Date:	31 May-06 03:05 PM	Protocol:	EPA/821/R-02-012 (2002)				Species:	Americamysis bahia						
Ending Date:	04 Jun-06 01:35 PM	Dil Water:	Natural Seawater				Source:	ARO - Aquatic Research Organisms, N						
Setup Date:	31 May-06 03:05 PM	Brine:	Generic commercial salts											
Sample No:	04-7158-0505	Material:	Industrial Effluent				Client:	CH2M Hill						
Sample Date:	25 May-06	Code:	14584				Project:	WET Quarterly Compliance Test (2Q)						
Receive Date:	31 May-06 12:15 PM	Source:	CH2M Hill- American Samoa											
Sample Age:	6d 15h (8 °C)	Station:	Joint Cannery Outfall											
Endpoint	Analysis Type			Sample Link	Control Link	Date Analyzed	Version							
72h Proportion Survived	Comparison			12-0159-0837	12-0159-0837	18 Jul-06 4:29 PM	CETISv1.026							
Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp						
Bonferroni Adj Wilcoxon Rank Sum	C > T	Angular (Corrected)		25	50	4.00	35.355	40.24%						
ANOVA Assumptions														
Attribute	Test		Statistic	Critical	P Level	Decision(0.01)								
Variances	Bartlett		24.92201	16.81190	0.00035	Unequal Variances								
Distribution	Shapiro-Wilk W		0.94083	0.90818	0.08690	Normal Distribution								
ANOVA Table														
Source	Sum of Squares		Mean Square	DF	F Statistic	P Level	Decision(0.05)							
Between	5.105493		0.8509156	6	9.67	0.00001	Significant Effect							
Error	2.376137		0.0880051	27										
Total	7.48163009		0.9389206	33										
Group Comparisons														
Control	vs	Conc-%	Statistic	Critical	P Level	Ties	Decision(0.05)							
Lab Water		6.25	27.5		0.5000	2	Non-Significant Effect							
		12.5	27.5		0.5000	2	Non-Significant Effect							
		25	21		0.1111	1	Non-Significant Effect							
		50	15		0.0040	2	Significant Effect							
		75	18		0.0278	2	Non-Significant Effect							
		100	10		0.0079	2	Significant Effect							
Data Summary														
Original Data			Transformed Data											
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD				
0	Lab Water	5	0.98000	0.90000	1.00000	0.04472	1.37942	1.24905	1.41202	0.07288				
6.25		5	0.98000	0.90000	1.00000	0.04472	1.37942	1.24905	1.41202	0.07288				
12.5		5	0.98000	0.90000	1.00000	0.04472	1.37942	1.24905	1.41202	0.07288				
25		5	0.68000	0.30000	1.00000	0.32711	1.01591	0.57964	1.41202	0.39193				
50		5	0.34000	0.10000	0.70000	0.25100	0.60512	0.32175	0.99116	0.27471				
75		5	0.42000	0.00000	1.00000	0.42661	0.68021	0.15878	1.41202	0.53216				
100		4	0.15000	0.00000	0.50000	0.23805	0.35618	0.15878	0.78540	0.29628				
Data Detail														
Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10			
0	Lab Water	1.00000	1.00000	1.00000	0.90000	1.00000								
6.25		1.00000	1.00000	1.00000	1.00000	0.90000								
12.5		1.00000	0.90000	1.00000	1.00000	1.00000								
25		0.70000	1.00000	0.40000	1.00000	0.30000								
50		0.70000	0.10000	0.20000	0.20000	0.50000								
75		0.60000	0.50000	0.00000	1.00000	0.00000								
100		0.00000	0.00000	0.50000	0.10000									

# CETIS Analysis Detail

Comparisons:

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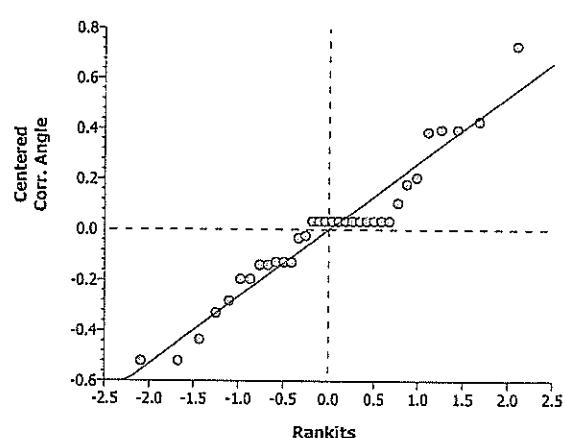
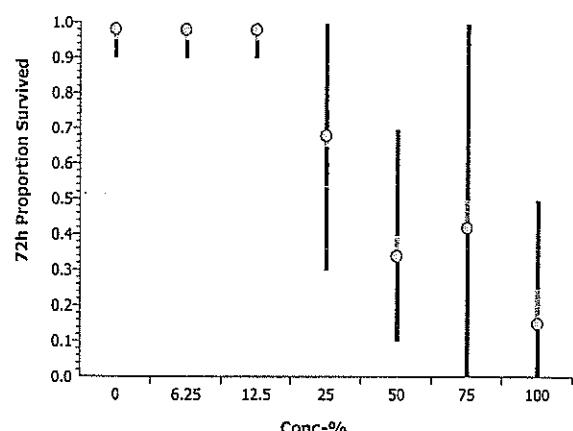
Report Date:

18 Jul-06 4:30 PM

Analysis:

06-5810-1487

## Graphics



# CETIS Analysis Detail

Americamysis 96-h Acute Survival Test							EnviroSystems, Inc.				
Test No:	16-7688-1623	Test Type:	Survival (96h)			Duration:	94h				
Start Date:	31 May-06 03:05 PM	Protocol:	EPA/821/R-02-012 (2002)			Species:	Americamysis bahia				
Ending Date:	04 Jun-06 01:35 PM	Dil Water:	Natural Seawater			Source:	ARO - Aquatic Research Organisms, N				
Setup Date:	31 May-06 03:05 PM	Brine:	Generic commercial salts								
Sample No:	04-7158-0505	Material:	Industrial Effluent			Client:	CH2M Hill				
Sample Date:	25 May-06	Code:	14584			Project:	WET Quarterly Compliance Test (2Q)				
Receive Date:	31 May-06 12:15 PM	Source:	CH2M Hill- American Samoa								
Sample Age:	6d 15h (8 °C)	Station:	Joint Cannery Outfall								
Endpoint	Analysis Type		Sample Link	Control Link	Date Analyzed	Version					
96h Proportion Survived	Comparison		12-0159-0837	12-0159-0837	18 Jul-06 4:29 PM	CETISv1.026					
Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp			
Dunnett's Multiple Comparison	C > T	Angular (Corrected)		12.5	25	8.00	17.678	19.15%			
Test Acceptability											
Attribute	Statistic	Acceptable Range	Decision								
Control Response	0.96	0.9 - N/A	Passes acceptability criteria								
ANOVA Assumptions											
Attribute	Test	Statistic	Critical	P Level	Decision(0.01)						
Variances	Bartlett	9.35680	15.08628	0.09565	Equal Variances						
Distribution	Shapiro-Wilk W	0.91758	0.89981	0.02886	Normal Distribution						
ANOVA Table											
Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)					
Between	5.274173	1.054835	5	32.52	0.00000	Significant Effect					
Error	0.7784472	0.0324353	24								
Total	6.05261993	1.0872699	29								
Group Comparisons											
Control	vs	Conc-%	Statistic	Critical	P Level	MSD	Decision(0.05)				
Lab Water		6.25	0	2.36	> 0.0500	0.26881	Non-Significant Effect				
		12.5	0.28615	2.36	> 0.0500	0.26881	Non-Significant Effect				
		25	4.11487	2.36	<= 0.0500	0.26881	Significant Effect				
		50	6.66931	2.36	<= 0.0500	0.26881	Significant Effect				
		75	9.50678	2.36	<= 0.0500	0.26881	Significant Effect				
Data Summary											
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD	
0	Lab Water	5	0.96000	0.90000	1.00000	0.05477	1.34683	1.24905	1.41202	0.08926	
6.25		5	0.96000	0.90000	1.00000	0.05477	1.34683	1.24905	1.41202	0.08926	
12.5		5	0.94000	0.90000	1.00000	0.05477	1.31423	1.24905	1.41202	0.08926	
25		5	0.58000	0.30000	0.90000	0.23875	0.87813	0.57964	1.24905	0.26312	
50		5	0.32000	0.10000	0.60000	0.19235	0.58717	0.32175	0.88608	0.21484	
75		5	0.08000	0.00000	0.40000	0.17889	0.26397	0.15878	0.68472	0.23521	
Data Detail											
Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water	1.00000	1.00000	1.00000	0.90000	0.90000					
6.25		1.00000	0.90000	1.00000	1.00000	0.90000					
12.5		1.00000	0.90000	0.90000	0.90000	1.00000					
25		0.70000	0.90000	0.40000	0.60000	0.30000					
50		0.60000	0.10000	0.20000	0.30000	0.40000					
75		0.40000	0.00000	0.00000	0.00000	0.00000					

# CETIS Analysis Detail

Comparisons:

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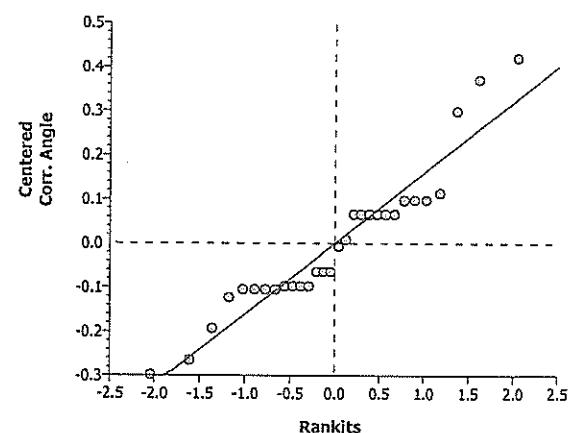
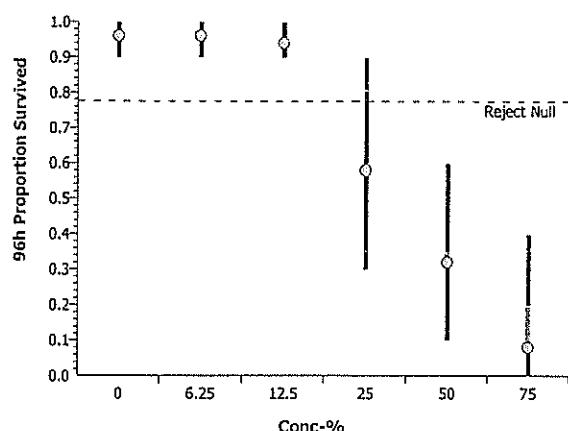
Report Date:

18 Jul-06 4:30 PM

Analysis:

10-1522-2120

## Graphics



# CETIS Analysis Detail

Americamysis 96-h Acute Survival Test							EnviroSystems, Inc.							
Test No:	16-7688-1623	Test Type:	Survival (96h)				Duration:	94h						
Start Date:	31 May-06 03:05 PM	Protocol:	EPA/821/R-02-012 (2002)				Species:	Americamysis bahia						
Ending Date:	04 Jun-06 01:35 PM	Dil Water:	Natural Seawater				Source:	ARO - Aquatic Research Organisms, N						
Setup Date:	31 May-06 03:05 PM	Brine:	Generic commercial salts											
Sample No:	04-7158-0505	Material:	Industrial Effluent				Client:	CH2M Hill						
Sample Date:	25 May-06	Code:	14584				Project:	WET Quarterly Compliance Test (2Q)						
Receive Date:	31 May-06 12:15 PM	Source:	CH2M Hill- American Samoa											
Sample Age:	6d 15h (8 °C)	Station:	Joint Cannery Outfall											
Endpoint	Analysis Type			Sample Link	Control Link	Date Analyzed	Version							
48h Proportion Survived	Comparison			12-0159-0837	12-0159-0837	18 Jul-06 4:29 PM	CETISv1.026							
Method	Alt H	Data Transform			Z	NOEL	LOEL	Toxic Units	ChV	MSDp				
Steel's Many-One Rank	C > T	Angular (Corrected)				25	50	4.00	35.355	35.89%				
ANOVA Assumptions														
Attribute	Test	Statistic			Critical	P Level	Decision(0.01)							
Variances	Bartlett	25.20560			16.81190	0.00031	Unequal Variances							
Distribution	Shapiro-Wilk W	0.95120			0.91004	0.16196	Normal Distribution							
ANOVA Table														
Source	Sum of Squares		Mean Square	DF	F Statistic	P Level	Decision(0.05)							
Between	4.891127		0.8151878	6	8.78	0.00002	Significant Effect							
Error	2.600772		0.0928847	28										
Total	7.49189854		0.9080725	34										
Group Comparisons														
Control	vs	Conc-%	Statistic	Critical	P Level	Ties	Decision(0.05)							
Lab Water		6.25	27.5	16	> 0.0500	2	Non-Significant Effect							
		12.5	27.5	16	> 0.0500	2	Non-Significant Effect							
		25	21	16	> 0.0500	1	Non-Significant Effect							
		50	15	16	<= 0.0500	2	Significant Effect							
		75	18	16	> 0.0500	2	Non-Significant Effect							
		100	15	16	<= 0.0500	2	Significant Effect							
Data Summary														
Original Data			Transformed Data											
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD				
0	Lab Water	5	0.98000	0.90000	1.00000	0.04472	1.37942	1.24905	1.41202	0.07288				
6.25		5	0.98000	0.90000	1.00000	0.04472	1.37942	1.24905	1.41202	0.07288				
12.5		5	0.98000	0.90000	1.00000	0.04472	1.37942	1.24905	1.41202	0.07288				
25		5	0.68000	0.30000	1.00000	0.32711	1.01591	0.57964	1.41202	0.39193				
50		5	0.34000	0.10000	0.70000	0.25100	0.60512	0.32175	0.99116	0.27471				
75		5	0.42000	0.00000	1.00000	0.42661	0.68021	0.15878	1.41202	0.53216				
100		5	0.24000	0.00000	0.60000	0.28810	0.46216	0.15878	0.88608	0.34928				
Data Detail														
Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10			
0	Lab Water	1.00000	1.00000	1.00000	0.90000	1.00000								
6.25		1.00000	1.00000	1.00000	1.00000	0.90000								
12.5		1.00000	0.90000	1.00000	1.00000	1.00000								
25		0.70000	1.00000	0.40000	1.00000	0.30000								
50		0.70000	0.10000	0.20000	0.20000	0.50000								
75		0.60000	0.50000	0.00000	1.00000	0.00000								
100		0.60000	0.00000	0.00000	0.50000	0.10000								

# CETIS Analysis Detail

Comparisons:

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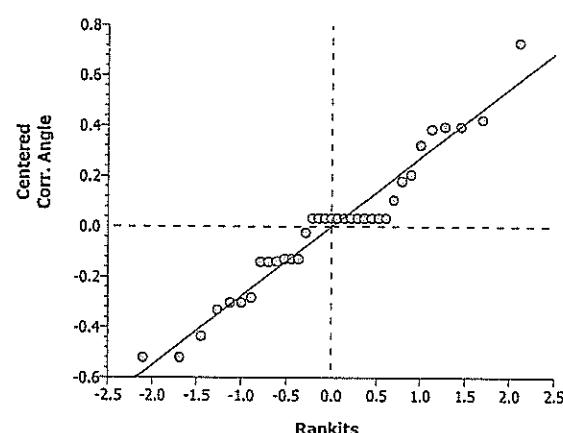
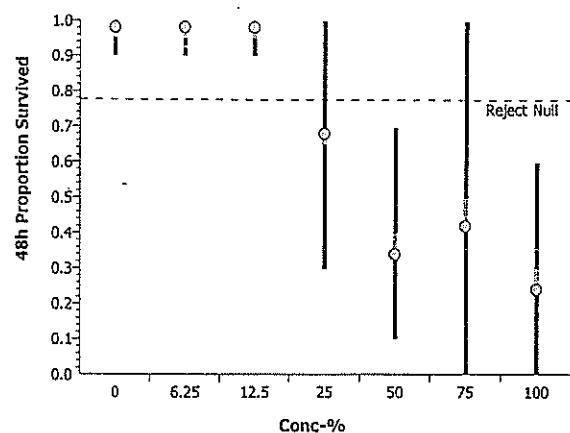
Report Date:

18 Jul-06 4:30 PM

Analysis:

11-4142-6689

## Graphics



# CETIS Analysis Detail

Spearman-Karber: Page 1 of 4  
 Report Date: 18 Jul-06 4:30 PM  
 Analysis: 05-8376-2064

Americamysis 96-h Acute Survival Test								EnviroSystems, Inc.
Test No:	16-7688-1623	Test Type:	Survival (96h)		Duration:	94h		
Start Date:	31 May-06 03:05 PM	Protocol:	EPA/821/R-02-012 (2002)		Species:	Americamysis bahia		
Ending Date:	04 Jun-06 01:35 PM	Dil Water:	Natural Seawater		Source:	ARO - Aquatic Research Organisms, N		
Setup Date:	31 May-06 03:05 PM	Brine:	Generic commercial salts					
Sample No:	04-7158-0505	Material:	Industrial Effluent		Client:	CH2M Hill		
Sample Date:	25 May-06	Code:	14584		Project:	WET Quarterly Compliance Test (2Q)		
Receive Date:	31 May-06 12:15 PM	Source:	CH2M Hill- American Samoa					
Sample Age:	6d 15h (8 °C)	Station:	Joint Cannery Outfall					
Endpoint	Analysis Type		Sample Link	Control Link	Date Analyzed	Version		
48h Proportion Survived	Trimmed Spearman-Karber		12-0159-0837	12-0159-0837	27 Jun-06 11:49 AM	CETISv1.026		
Spearman-Karber Options					Point Estimates			
Threshold Option	Lower Threshold	Trim Level	Mu	Sigma	EC50/LC50	95% LCL	95% UCL	
Control Threshold	0.02	24.49%	1.635722	0.04680356	43.22371	34.84295	53.62029	
Data Summary			Calculated Variate(A/B)					
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SE	SD	A
0	Lab Water	5	0.98000	0.90000	1.00000	0.00913	0.04472	49
6.25		5	0.98000	0.90000	1.00000	0.00913	0.04472	49
12.5		5	0.98000	0.90000	1.00000	0.00913	0.04472	49
25		5	0.68000	0.30000	1.00000	0.06677	0.32711	34
50		5	0.34000	0.10000	0.70000	0.05123	0.25100	17
75		5	0.42000	0.00000	1.00000	0.08708	0.42661	21
100		5	0.24000	0.00000	0.60000	0.05881	0.28810	12
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SE	SD	B
0	Lab Water	5	0.98000	0.90000	1.00000	0.00913	0.04472	50
6.25		5	0.98000	0.90000	1.00000	0.00913	0.04472	50
12.5		5	0.98000	0.90000	1.00000	0.00913	0.04472	50
25		5	0.68000	0.30000	1.00000	0.06677	0.32711	50
50		5	0.34000	0.10000	0.70000	0.05123	0.25100	50
75		5	0.42000	0.00000	1.00000	0.08708	0.42661	50
100		5	0.24000	0.00000	0.60000	0.05881	0.28810	50

Graphics

Conc-%	48h Proportion Survived
0	1.00
10	0.98
20	0.70
50	0.35
75	0.40
100	0.22

# CETIS Analysis Detail

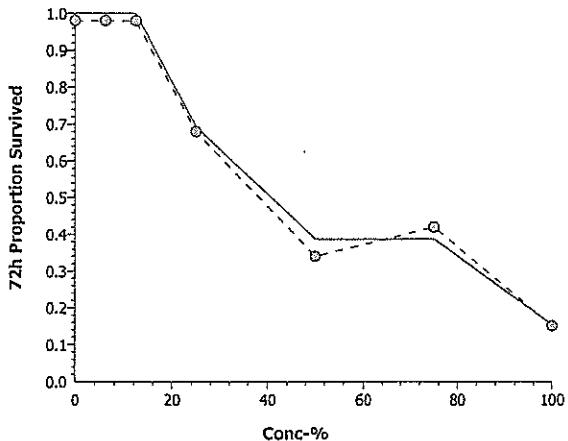
Spearman-Karber: Page 2 of 4  
 Report Date: 18 Jul-06 4:30 PM  
 Analysis: 09-2364-4726

Americamysis 96-h Acute Survival Test							EnviroSystems, Inc.			
Test No:	16-7688-1623	Test Type: Survival (96h)			Duration:	94h				
Start Date:	31 May-06 03:05 PM	Protocol: EPA/821/R-02-012 (2002)			Species:	Americamysis bahia				
Ending Date:	04 Jun-06 01:35 PM	Dil Water: Natural Seawater			Source:	ARO - Aquatic Research Organisms, N				
Setup Date:	31 May-06 03:05 PM	Brine: Generic commercial salts								
Sample No:	04-7158-0505	Material: Industrial Effluent			Client:	CH2M Hill				
Sample Date:	25 May-06	Code: 14584			Project:	WET Quarterly Compliance Test (2Q)				
Receive Date:	31 May-06 12:15 PM	Source: CH2M Hill- American Samoa								
Sample Age:	6d 15h (8 °C)	Station: Joint Cannery Outfall								
Endpoint	Analysis Type		Sample Link	Control Link	Date Analyzed	Version				
96h Proportion Survived	Trimmed Spearman-Karber		12-0159-0837	12-0159-0837	27 Jun-06 11:49 AM	CETISv1.026				
Spearman-Karber Options					Point Estimates					
Threshold Option	Lower Threshold	Trim Level	Mu	Sigma	EC50/LC50	95% LCL	95% UCL			
Control Threshold	0.04	0.00%	1.515089	0.02753091	32.74078	28.84212	37.16642			
Test Acceptability										
Attribute	Statistic		Acceptable Range		Decision					
Control Response	0.96		0.9 - N/A		Passes acceptability criteria					
Data Summary										
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SE	SD	A	B	
0	Lab Water	5	0.96000	0.90000	1.00000	0.01118	0.05477	48	50	
6.25		5	0.96000	0.90000	1.00000	0.01118	0.05477	48	50	
12.5		5	0.94000	0.90000	1.00000	0.01118	0.05477	47	50	
25		5	0.58000	0.30000	0.90000	0.04873	0.23875	29	50	
50		5	0.32000	0.10000	0.60000	0.03926	0.19235	16	50	
75		5	0.08000	0.00000	0.40000	0.03651	0.17889	4	50	
100		5	0.00000	0.00000	0.00000	0.00000	0.00000	0	50	
Graphics										

# CETIS Analysis Detail

Americamysis 96-h Acute Survival Test							EnviroSystems, Inc.		
Test No:	16-7688-1623	Test Type:	Survival (96h)			Duration:	94h		
Start Date:	31 May-06 03:05 PM	Protocol:	EPA/821/R-02-012 (2002)			Species:	Americamysis bahia		
Ending Date:	04 Jun-06 01:35 PM	Dil Water:	Natural Seawater			Source:	ARO - Aquatic Research Organisms, N		
Setup Date:	31 May-06 03:05 PM	Brine:	Generic commercial salts						
Sample No:	04-7158-0505	Material:	Industrial Effluent			Client:	CH2M Hill		
Sample Date:	25 May-06	Code:	14584			Project:	WET Quarterly Compliance Test (2Q)		
Receive Date:	31 May-06 12:15 PM	Source:	CH2M Hill- American Samoa						
Sample Age:	6d 15h (8 °C)	Station:	Joint Cannery Outfall						
Endpoint	Analysis Type		Sample Link	Control Link	Date Analyzed	Version			
72h Proportion Survived	Trimmed Spearman-Karber		12-0159-0837	12-0159-0837	27 Jun-06 11:49 AM	CETISv1.026			
Spearman-Karber Options					Point Estimates				
Threshold Option	Lower Threshold	Trim Level	Mu	Sigma	EC50/LC50	95% LCL	95% UCL		
Control Threshold	0.02	15.31%	1.630251	0.03772391	42.68265	35.87596	50.78076		
Data Summary			Calculated Variate(A/B)						
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SE	SD	A	B
0	Lab Water	5	0.98000	0.90000	1.00000	0.00913	0.04472	49	50
6.25		5	0.98000	0.90000	1.00000	0.00913	0.04472	49	50
12.5		5	0.98000	0.90000	1.00000	0.00913	0.04472	49	50
25		5	0.68000	0.30000	1.00000	0.06677	0.32711	34	50
50		5	0.34000	0.10000	0.70000	0.05123	0.25100	17	50
75		5	0.42000	0.00000	1.00000	0.08708	0.42661	21	50
100		4	0.15000	0.00000	0.50000	0.04859	0.23805	6	40

## Graphics



## CETIS Analysis Detail

Americamysis 96-h Acute Survival Test						EnviroSystems, Inc.			
Test No:	16-7688-1623	Test Type: Survival (96h)			Duration:	94h			
Start Date:	31 May-06 03:05 PM	Protocol: EPA/821/R-02-012 (2002)			Species:	Americamysis bahia			
Ending Date:	04 Jun-06 01:35 PM	Dil Water: Natural Seawater			Source:	ARO - Aquatic Research Organisms, N			
Setup Date:	31 May-06 03:05 PM	Brine: Generic commercial salts							
Sample No:	04-7158-0505	Material: Industrial Effluent			Client:	CH2M Hill			
Sample Date:	25 May-06	Code: 14584			Project:	WET Quarterly Compliance Test (2Q)			
Receive Date:	31 May-06 12:15 PM	Source: CH2M Hill- American Samoa							
Sample Age:	6d 15h (8 °C)	Station: Joint Cannery Outfall							
Endpoint	Analysis Type		Sample Link	Control Link	Date Analyzed	Version			
24h Proportion Survived	Trimmed Spearman-Karber		12-0159-0837	12-0159-0837	27 Jun-06 11:49 AM	CETISv1.026			
Spearman-Karber Options					Point Estimates				
Threshold Option	Lower Threshold	Trim Level	Mu	Sigma	EC50/LC50	95% LCL	95% UCL		
Control Threshold	0	38.00%	1.702167	0.07609422	50.36943	35.47959	71.50814		
Data Summary				Calculated Variate(A/B)					
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SE	SD	A	B
0	Lab Water	5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
6.25		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
12.5		5	0.98000	0.90000	1.00000	0.00913	0.04472	49	50
25		5	0.80000	0.30000	1.00000	0.05951	0.29155	40	50
50		5	0.36000	0.10000	0.80000	0.05881	0.28810	18	50
75		5	0.52000	0.00000	1.00000	0.09725	0.47645	26	50
100		5	0.38000	0.00000	0.70000	0.07274	0.35637	19	50

Graphics	
<p>The graph plots the 24-hour proportion survived against the concentration (Conc-%). The y-axis ranges from 0.0 to 1.0 in increments of 0.1. The x-axis ranges from 0 to 100 in increments of 20. Data points are shown as open circles at concentrations of 0, 6.25, 12.5, 25, 50, 75, and 100. A solid line connects these points. A dashed line extrapolates the curve back to 100% survival, which occurs at approximately 50% concentration.</p>	

## CETIS Data Worksheet

Americamysis 96-h Acute Survival Test

EnviroSystems, Inc.

Start Date: 31 May-06 03:05 PM Species: Americamysis bahia  
 Ending Date: 04 Jun-06 01:35 PM Protocol: EPA/821/R-02-012 (2002)  
 Sample Date: 25 May-06 Material: Industrial Effluent

Sample Code: 14584  
 Sample Source: CH2M Hill- American Samoa  
 Sample Station: Joint Cannery Outfall

Conc-%	Code	Rep	Pos	# Exposed	24h Survival	48h Survival	72h Survival	96h Survival	Notes
0	L	1	16	10	10	10	10	10	
0	L	2	5	10	10	10	10	10	
0	L	3	33	10	10	10	10	10	
0	L	4	31	10	10	9	9	9	
0	L	5	22	10	10	10	10	9	
6.25		1	13	10	10	10	10	10	
6.25		2	26	10	10	10	10	9	
6.25		3	6	10	10	10	10	10	
6.25		4	25	10	10	10	10	10	
6.25		5	20	10	10	9	9	9	
12.5		1	4	10	10	10	10	10	
12.5		2	30	10	9	9	9	9	
12.5		3	7	10	10	10	10	9	
12.5		4	34	10	10	10	10	9	
12.5		5	2	10	10	10	10	10	
25		1	1	10	9	7	7	7	
25		2	28	10	10	10	10	9	
25		3	11	10	8	4	4	4	
25		4	19	10	10	10	10	6	
25		5	10	10	3	3	3	3	
50		1	8	10	8	7	7	6	
50		2	23	10	1	1	1	1	
50		3	21	10	2	2	2	2	
50		4	27	10	2	2	2	3	
50		5	3	10	5	5	5	4	
75		1	18	10	10	6	6	4	
75		2	12	10	5	5	5	0	
75		3	9	10	0	0	0	0	
75		4	32	10	10	10	10	0	
75		5	24	10	1	0	0	0	
100		1	14	10	7	6		0	
100		2	29	10	0	0	0	0	
100		3	17	10	0	0	0	0	
100		4	35	10	7	5	5	0	
100		5	15	10	5	1	1	0	



## Aquatic Research Organisms

### DATA SHEET

#### I. Organism History

Species: AMERISTHYYSIS hahnia  
Source: Lab reared  Hatchery reared \_\_\_\_\_ Field collected \_\_\_\_\_  
Hatch date 5-27-06 Receipt date \_\_\_\_\_  
Lot number 052706HS Strain \_\_\_\_\_  
Brood Origination Florida

#### II. Water Quality

Temperature 25 °C Salinity 230 ppt DO —  
pH 7.8 Hardness — ppm

#### III. Culture Conditions

System: Recirc  
Diet: Flake Food  Phytoplankton \_\_\_\_\_ Trout Chow   
Brine Shrimp  Rotifers \_\_\_\_\_ Other Ecto Shrimp Diet  
Prophylactic Treatments: \_\_\_\_\_  
Comments: \_\_\_\_\_  
\_\_\_\_\_

#### IV. Shipping Information

Client: EST # of Organisms: 700+

Carrier: \_\_\_\_\_ Date Shipped: 5-31-06

Biologist: Mark Daeninger

1 - 800 - 927 - 1650

PO Box 1271 • One Lafayette Road • Hampton, NH 03842 • (603) 926-1650

EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA

PARAMETER	100% Effluent	50% Effluent	Diluent - Lab Salt
TRC	<0.05		<0.05
As Received - pH (SU) @ 20°C	10.55		7.33
As Received - Salinity (ppt)	11.5		25
As Received - Dissolved Oxygen (mg/L)‡	1.7		5.7
As Received - Ammonia (pull)	-002		(83) 100414520-015
Salinity Adjusted - pH (SU) @ 20°C	7.03	7.35	
Salinity Adjusted - Salinity (ppt)	24.9	25	
After Aeration - Dissolved Oxygen (mg/L)	6.2	6.0	
Salinity Adjusted - Ammonia (pull)		-003	
48 hour Ammonia (pull)	-004	-005	-006
48 hour pH (SU) @ 20°C	7.39	7.64	7.97

‡ - Aerate prior to mixing concentrations.

PREPARATION OF DILUTIONS

STUDY: 14584		CLIENT: CH2M HILL - American Samoa						
SPECIES: A. bahia								
Diluent:	Day: 0	Day: 2						
Lab Salt	Sample: EOA	Sample: EOA	Concentration	Vol. Eff.	Final Vol	Vol. Eff.	Final Vol	HRS Date Time Initials
LAB	0	1000	6.25%	62.5	1	46.9	1	0 5/31 1505 EG
			12.5%	125	1	93.7	1	48 6/2 1510 EG
			25%	250	1	187.5	1	
			50%	500	1	375	1	
			75%	750	1	562.5	1	
			100%	1000	1	750	1	585

# RECORD OF METERS USED FOR WATER QUALITY MEASUREMENTS

STUDY: 14584	CLIENT: CH2M HILL - American Samoa					
WATER QUALITIES - A. bahia						
HOURS:	0	24	48 - old	48 - new	72	96
Water Quality Station #	1	1	1	1	1	2
Initials	ea	eb	ea	ea	ye	SJ
Date	5/31/06	6/1	6/2	6/2	6/3	6/4

Water Quality Station #1		Water Quality Station #2		COMMENTS
DO meter #	3	DO meter #	19	
DO probe #	13	DO probe #	12	
pH meter #	1097	pH meter #	470	
pH probe #	44	pH probe #	45	
S/C meter #	YSI 30B	S/C meter #	YSI3CB	
S/C probe #	11	S/C probe #	1	
Salinity meter #	1	Salinity meter #	1	

Report No: 14584 SDG:  
Project: American Samoa

Sample ID: Effluent  
Matrix: Water  
Sampled: 05/25/06

Parameter	Result	Quant Limit	Units	Date Prepared	Date of Analysis	Method/Reference
Ammonia-N	14584-002	24	0.2	mg/L as N	06/06/06	06/06/06 SM 4500-NH3 G
Ammonia-N	14584-005	13	0.1	mg/L as N	06/06/06	06/06/06 SM 4500-NH3 G
Ammonia-N	14584-003	12	0.1	mg/L as N	06/06/06	06/06/06 SM 4500-NH3 G
Ammonia-N	14584-004	20	0.1	mg/L as N	06/06/06	06/06/06 SM 4500-NH3 G

Notes:

Report No: 14584  
Project: American Samoa

Sample ID: Diluent - Lab Salt  
Matrix: Water  
Sampled: 06/02/06

SDG:

Parameter	Result	Quant Limit	Units	Date Prepared	Date of Analysis	Method/Reference	
Ammonia-N	14584-006	ND	0.1	mg/L as N	06/06/06	06/06/06	SM 4500-NH3 G

Notes:

ND = Not Detected

ESI

Report No: 14520 SDG:  
Project: American Samoa

Sample ID: ESIN1 LAB SALT 25PPT 05310  
Matrix: Water  
Sampled: 05/31/06

Parameter	Result	Quant Limit	Units	Date Prepared	Date of Analysis	Method/Reference
Ammonia-N	14520-015	0.23	0.1 mg/L as N	06/06/06	06/06/06	SM 4500-NH3 G

Notes:

STUDY: 14584

CLIENT: CH2MHill - American Samoa

PROJECT: Wastewater Treatment Plant

TASK: Unionized Ammonia Calculations

Day / Date	Treatment	Sample		Unionized	
		Temperature Deg C	pH SU	NH3 mg/L	NH3 mg/L
Day 0	Lab Diluent	20	7.33	0.23	0.002
	50% Effluent	20	7.35	12.0	0.105
	100% Effluent	20	7.03	24.0	0.101
Day 2	Lab Diluent	20	7.97	0.1	0.004
	50% Effluent	20	7.64	13.0	0.221
	100% Effluent	20	7.39	20.0	0.192

**ESI**

EnviroSystems, Inc.  
One Lafayette Road  
P.O. Box 778  
Hampton, NH 03843-0778  
Telephone: 603-926-3345

## SAMPLE RECEIPT RECORD

ESI STUDY NUMBER: 14584 CLIENT: CH2M Hill

**SAMPLE RECEIPT:**

DATE: 5/31/04 TIME: 1215 BY: CP

DELIVERED VIA:  FEDEX  CLIENT  ESI  UPS  OTHER DHL

**LOGGED INTO LAB:**

DATE: 5/31/04 TIME: 1220 BY: EG

**SAMPLE CONDITION:**

CHAIN OF CUSTODY:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
CHAIN OF CUSTODY SIGNED:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
CHAIN OF CUSTODY COMPLETE:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
SAMPLE DATE:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
SAMPLE TIME RECORDED:	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
SAMPLE TYPE IDENTIFIED:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
CUSTODY SEAL IN PLACE:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
SHIPPING CONTAINER INTACT:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
SAMPLE TEMPERATURE (AT ARRIVAL):	<u>8</u> °C	
DOES CLIENT NEED NOTIFICATION OF TEMPERATURE?	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
SAMPLE ARRIVED ON ICE:	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO

**COMMENTS:**

1 x 5 gal Eff

UNIVITI  
APPLIED SCIENCES LABORATORY

## CHAIN OF CUSTODY RECORD AND AGREEMENT TO PERFORM SERVICES

CH2M Hill Project # <b>147323.JC.06.NT</b>	Purchase Order #	LAB TEST CODES							SHADED AREA - FOR LAB USE ONLY								
Project Name <b>SAMOA JOINT CANNERY OUTFALL</b>		#							Lab 1 #	Lab 2 #							
Company Name/CH2M HILL Office <b>CH2M HILL/PO BOX 1238/TRINIDAD, CA 95570</b>		OF							Quote #	Kit Request #							
Project Manager & Phone # Mr. [ ] <b>STEVE COSTA</b> Ms. [ ] Dr. [ ] <b>707-677-0123</b>		CONTAINER	ANALYSES REQUESTED							Project #							
Report Copy to:		Sampling Requirements	Sample Disposal:									No. of Samples	Page _____ of _____				
Requested Completion Date:		SDWA	NPDES	RCRA	OTHER	Dispose	Return								Login	LIMS Ver.	
		C O M P	G R A B	W A T E R	S O L	A I R								REMARKS	LAB 1 ID	LAB 2 ID	
		CLIENT SAMPLE ID (9 CHARACTERS)															
Date	Time	JC006SUPP1X															
5/25/06	X X																
Sampled By & Title <i>S. A. West</i>		(Please sign and print name)		Date/Time <i>5/25/06</i>		Relinquished By <i>S. A. West</i>		(Please sign and print name)		Date/Time <i>5/25/06</i>		QC Level: 1 2 3 Other: <input checked="" type="checkbox"/>					
Received By <i>DHL</i>		(Please sign and print name)		Date/Time <i>5/25/06</i>		Relinquished By <i>DHL</i>		(Please sign and print name)		Date/Time <i>5/25/06</i>		COC Rec <input checked="" type="checkbox"/>					
Received By <i>C. P. D.</i>		(Please sign and print name)		Date/Time <i>5/31/06</i>		Relinquished By <i>1215</i>		(Please sign and print name)		Date/Time <i>5/31/06</i>		ICE <input checked="" type="checkbox"/>					
Received By <i>C. P. D.</i>		(Please sign and print name)		Date/Time <i>5/31/06</i>		Shipped Via UPS BUS Fed-Ex Hand Other <i>DHL</i>		Shipping #		Ana. Req. <input checked="" type="checkbox"/>							
Work Authorized By <i>C. P. D.</i>		(Please sign and print name)		Remarks <i>As per email instructions</i>						Cust. Seal <input checked="" type="checkbox"/>							

Instructions and Agreement Provisions on Reverse Side

DISTRIBUTION: Original - LAB, Yellow - LAB, Pink - Client  
REV 3/94 FORM 340

**ATTACHMENT III**

**EnviroSystems, Inc. Laboratory Report  
for November 2006 Bioassay**

**TOXICOLOGICAL EVALUATION  
OF A TREATED EFFLUENT:  
BIOMONITORING SUPPORT FOR A NPDES PERMIT  
NOVEMBER 2006**

**American Samoa Joint Cannery Outfall**

Prepared For

CH2M Hill, Incorporated  
P.O. Box 1238  
Trinidad, California 95570-1238

By

EnviroSystems, Incorporated  
One Lafayette Road  
Hampton, New Hampshire 03842

November 2006  
Reference Number CH2M-Samoa15231-06-11

## **STUDY NUMBER 15231**

### **EXECUTIVE SUMMARY**

The following summarizes the results of acute exposure bioassays performed from November 16-20, 2006 in support of the NPDES biomonitoring requirements of the American Samoa Joint Cannery Outfall. The 96 hour acute definitive assay was conducted using the marine species, *Americamysis bahia*.

#### **Acute Toxicity Evaluation**

<b>Species</b>	<b>Exposure</b>	<b>LC-50</b>	<b>NOEC</b>	<b>LOEC</b>
<i>Americamysis bahia</i>	24-Hours	55.1%	50%	75%
	48-Hours	51.9%	50%	75%
	72-Hours	50.5%	50%	75%
	96-Hours	43.1%	25%	50%

**TOXICOLOGICAL EVALUATION  
OF A TREATED EFFLUENT:  
BIOMONITORING SUPPORT FOR A NPDES PERMIT  
NOVEMBER 2006**

**American Samoa Joint Cannery Outfall**

**1.0 INTRODUCTION**

This report presents the results of an acute toxicity test conducted on an effluent sample collected from the American Samoa Joint Cannery Outfall. Testing was based on programs and protocols developed by the US EPA (2002) and involved conducting 96 hour acute static renewal toxicity tests with the marine species, *Americamysis bahia*. Testing was performed at EnviroSystems, Incorporated (ESI), Hampton, New Hampshire in accordance with the provisions of the NELAC Standards (2000).

Acute toxicity tests involve preparing a series of concentrations by diluting effluent with control water. Groups of test organisms are exposed to each effluent concentration and a control for a specified period. In acute tests, mortality data for each concentration are used to calculate (by regression) the median lethal concentration, or LC-50, defined as the effluent concentration which kills half of the test organisms. Samples with high LC-50 values are less likely to cause significant environmental impact. The acute no observed effect concentration (NOEC) and lowest observed effect concentration (LOEC) document the highest and lowest effluent concentrations that have no impact and a significant impact on the test species, respectively.

**2.0 MATERIALS AND METHODS**

**2.1 General Methods**

Toxicological and analytical protocols used in this program follow procedures primarily designed by the EPA to provide standard approaches for the evaluation of toxicological effects of discharges on aquatic organisms, and for the analysis of water samples. See Section 4.0 for a list of references.

**2.2 Test Species**

Every attempt was made to acquire the species, *Penaeus vannami*, as this is the preferred organism under the Cannery's permit. ESI was unable to obtain reasonably priced *P. vannami*. Due to the exorbitant expense, the decision was made to use an alternate species, *Americamysis bahia*.

*A. bahia*, ≤5 days old, were from maintained at ESI. Test organisms were transferred to test chambers by large bore pipet, minimizing the amount of water added to test solutions.

### 2.3 Effluent and Dilution Water

The effluent sample used in the assay was identified as "JC0-06TW". Sample collection information is provided in Table 1. Upon receipt, the sample was stored at 4°C. All sample material used in the assay was warmed to 20±1°C prior to preparing test solutions. Total residual chlorine (TRC) was measured using amperometric titration (MDL 0.05 mg/L). As the effluent sample contained <0.05 mg/L, TRC dechlorination with sodium thiosulfate was not required (EPA 2002). Aliquots of the undiluted effluent sample were collected for ammonia analysis when the sample arrived and again prior to renewal. Upon arrival, the effluent sample had a salinity of 11‰. Salinity of the effluent was increased to 25‰ by the addition of artificial sea salts. Test concentrations for the assays were 100%, 75%, 50%, 25%, 12.5%, and 6.25% effluent with a laboratory water diluent control.

The dilution water used in this assay was collected from the sea water system at ESI. The water is pumped in daily from the Hampton Estuary on the flood tide, filtered through a high volume sand filter, and stored in 3000 gallon polyethylene tanks. The water is classified as Class SA-1 by the State of New Hampshire, and has been used to culture test organisms for over 20 years. Sea water used in the assay had a salinity of 25±2‰ and a TRC of <0.05 mg/L.

### 2.4 Acute Toxicity Tests

The 96 hour acute static renewal toxicity test was conducted at 20±2°C with a photoperiod of 16:8 hours light:dark. Test chambers for the acute assays were 250 mL glass beakers containing 200 mL test solution in each of 5 replicates, with 10 organisms/replicate. Survival, dissolved oxygen, pH, salinity and temperature were measured daily in all replicates. Test solutions were renewed after 48 hours using effluent from the start sample. Mysid shrimp were fed daily with <24 hour old brine shrimp.

### 2.5 Data Analysis

At 24 hour intervals, survival data was analyzed to assess toxicity using CETIS, Comprehensive Environmental Toxicity Testing System, software. The program computes acute exposure endpoints based on EPA decision tree guidelines specified in individual test methods. For acute exposure endpoints statistical significance was accepted at  $\approx$  <0.05.

### 2.6 Quality Control

As part of the laboratory quality control program, standard reference toxicant assays are conducted on a regular basis for each test species. These results provide relative health and response data while allowing for comparison with historic data sets. See Table 2 for details.

### **3.0 RESULTS**

Results of the acute exposure bioassay conducted using the mysid shrimp, *A. bahia*, are summarized in Table 3. Effluent and dilution water characteristics are presented in Table 4. Table 5 provides a summary of historic data associated with the discharge. Support data are included in Appendix A.

#### **3.1 Acute Toxicity Test - *Americanamysis bahia***

Minimum test acceptability criteria require ≥90% survival in the control concentration. As the laboratory water diluent control met or exceeded this protocol specification, results associated with the assay indicate healthy test organisms and that the dilution water had no adverse impact on the outcome of the assay. These data are considered as valid for evaluating impacts associated with the effluent sample.

Table 3 provides a summary of the acute exposure data and results.

#### **3.2 Summary**

The salinity adjusted effluent sample collected from the American Samoa Joint Cannery Outfall did exhibit signs of acute toxicity to the mysid shrimp, *Americanamysis bahia*, during the 96 hour exposure period.

### **4.0 LITERATURE CITED**

- APHA. 1998. *Standard Methods for the Examination of Water and Wastewater*, 20<sup>th</sup> Edition. Washington D.C.
- National Environmental Laboratory Accreditation Conference: Quality Systems*. Chapter 5. June 2000.
- Stephan, C. 1982. Documentation for Computing LC-50 Values with a Mini Computer. Unpublished.
- US EPA. 2002. *Attachment G: NPDES Whole Effluent Toxicity Testing, Monitoring and Reporting Tips and Common Pitfalls*. Dated December 2002. US EPA Region I Offices, Boston, Massachusetts.
- U.S. EPA. 2002. *Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms*. Fifth Edition. EPA-821-R-02-012.

**TABLE 1. Summary of Sample Collection Information.**  
**American Samoa Joint Cannery Outfall Effluent Evaluation.**  
**November 2006.**

Sample Description	Type	Collection		Receipt		Arrival Temp °C
		Date	Time	Date	Time	
EFFLUENT	Comp	11/07/08/06	ND	11/16/06	1200	18

**TABLE 2. Summary of Reference Toxicant Data.**  
**American Samoa Joint Cannery Outfall Effluent Evaluation.**  
**November 2006.**

Date	Endpoint	Value	Historic Mean/ Central Tendency	Acceptable Range	Reference Toxicant
<i>A. bahia</i>					
11/06/06	Survival	LC-50	18.4	20.3	15.5 - 25.4 SDS (mg/L)

Means and Acceptable Ranges based on the most recent 20 reference toxicant assays

**TABLE 3A. Summary of Acute Evaluation Results.**  
**American Samoa Joint Cannery Outfall Effluent Evaluation.**  
**November 2006.**

Concentration % Effluent	Exposure	Replicates					Mean	Standard Deviation	Coefficient of Variation
		A	B	C	D	E			
Lab Control	Start	10	10	10	10	10	100%	0.000	0.00%
	24-Hours	10	10	10	10	10	100%	0.000	0.00%
	48-Hours	10	10	10	10	10	100%	0.000	0.00%
	72 Hours	9	10	10	10	10	98%	0.400	4.08%
	96-Hours	9	10	10	10	10	98%	0.400	4.08%
6.25%	24-Hours	10	10	10	10	10	100%	0.000	0.00%
	48-Hours	10	10	10	10	10	100%	0.000	0.00%
	72 Hours	10	10	10	10	10	100%	0.000	0.00%
	96-Hours	10	10	10	10	10	100%	0.000	0.00%
12.5%	24-Hours	10	10	10	10	10	100%	0.000	0.00%
	48-Hours	10	10	10	10	10	100%	0.000	0.00%
	72 Hours	10	10	10	10	10	100%	0.000	0.00%
	96-Hours	10	10	10	10	10	100%	0.000	0.00%
25%	24-Hours	10	10	10	10	10	100%	0.000	0.00%
	48-Hours	10	10	10	10	9	98%	0.400	4.08%
	72 Hours	10	10	10	10	9	98%	0.400	4.08%
	96-Hours	8	9	8	10	9	88%	0.748	8.50%
50%	24-Hours	10	7	6	9	4	72%	2.135	29.66%
	48-Hours	10	7	6	9	3	70%	2.449	34.99%
	72 Hours	10	6	6	8	3	66%	2.332	35.34%
	96-Hours	8	3	4	5	3	46%	1.855	40.32%
75%	24-Hours	0	1	3	2	1	14%	1.020	72.84%
	48-Hours	0	0	2	0	0	4%	0.800	200.00%
	72 Hours	0	0	0	0	0	0%	0.000	??
	96-Hours	0	0	0	0	0	0%	0.000	??
100%	24-Hours	0	1	0	0	0	2%	0.400	200.00%
	48-Hours	0	0	0	0	0	0%	0.000	??
	72 Hours	0	0	0	0	0	0%	0.000	??
	96-Hours	0	0	0	0	0	0%	0.000	??

**TABLE 3B. Summary of Acute Evaluation Results. American Samoa Joint Cannery Outfall Effluent Evaluation. November 2006.**

Exposure Period	SUMMARY OF ENDPOINTS		NOEC	LOEC
	LC-50 (95% Limits)	METHOD		
24 Hours	55.1% (50.9-59.7)	Trimmed Spearman-Karber Direct Observation	50%	75%
48 Hours	51.9% (48.0-56.2)	Trimmed Spearman-Karber	50%	75%
72 Hours	50.5% (46.7-54.4)	Trimmed Spearman-Karber Direct Observation	50%	75%
96 Hours	43.1% (39.0-47.6)	Trimmed Spearman-Karber Direct Observation	25%	50%

**TABLE 4. Summary of Effluent and Diluent Characteristics. American Samoa Joint Cannery Outfall Effluent Evaluation. November 2006.**

PARAMETER	UNITS	100% EFFLUENT	50% EFFLUENT	DILUENT
Salinity - As Received	%	11	-	25
Salinity - After Salinity Adjustment	%	25	25	-
pH - As Received	SU	6.57	-	7.70
pH - After Salinity Adjustment	SU	7.48	7.59	-
TRC - As Received	mg/L	<0.05	-	<0.05
Dissolved Oxygen - As Received	mg/L	1.6	-	-
Dissolved Oxygen - After Aeration	mg/L	7.5	7.4	1.6
Ammonia - As Received	mg/L as N	60	-	<0.1
Unionized Ammonia - As Received	mg/L as N	0.709	-	<0.002
Ammonia - Salinity Adjusted	mg/L as N	-	34	-
Unionized Ammonia - Salinity Adjusted	mg/L as N	-	0.516	-
Ammonia - at 48 Hours	mg/L as N	33	20	5.3
Unionized Ammonia - at 48 Hours	mg/L as N	2.630	0.745	0.177

**TABLE 5. Summary of StarKist Samoa and COS Samoa Packing Combined Effluent Bioassay Results. American Samoa Joint Cannery Outfall Effluent Evaluation. November 2006.**

Date	Species	96-Hour Endpoints		
		LC-50	NOEC	LOEC
02/93 <sup>1</sup>	<i>Penaeus vannami</i>	4.8%	3.1%	6.25%
10/93 <sup>1</sup>	<i>Penaeus vannami</i>	15.67%	3.1%	6.25%
02/94 <sup>1</sup>	<i>Penaeus vannami</i>	15.76%	<1.6%	1.6%
10/94 <sup>1</sup>	<i>Americamysis bahia</i>	31.2%	25.0%	50.0%
03/95 <sup>1</sup>	<i>Penaeus vannami</i>	14.8%	6.25%	12.5%
03/95 <sup>1</sup>	<i>Americamysis bahia</i>	10.8%	6.25%	12.5%
02/96 <sup>1</sup>	<i>Penaeus vannami</i>	>50.0%	>50.0%	>50.0%
03/96 <sup>1</sup>	<i>Penaeus vannami</i>	44.4%	25.0%	50.0%
11/96 <sup>1</sup>	<i>Penaeus vannami</i>	7.11%	3.1%	6.25%
03/97 <sup>1</sup>	<i>Penaeus vannami</i>	39.36%	12.5%	25.0%
09/97 <sup>1</sup>	<i>Penaeus vannami</i>	12.3%	6.25%	12.5%
06/98 <sup>1</sup>	<i>Americamysis bahia</i>	17.2%	6.25%	12.5%
11/98 <sup>1</sup>	<i>Americamysis bahia</i>	15.0%	6.25%	12.5%
02/00 <sup>1</sup>	<i>Americamysis bahia</i>	20.0%	6.25%	12.5%
08/00 <sup>1</sup>	<i>Americamysis bahia</i>	17.1%	3.1%	6.25%
03/01 <sup>2</sup>	<i>Americamysis bahia</i>	13.81%	12.5%	25.0%
03/02 <sup>2</sup>	<i>Americamysis bahia</i>	16.13%	12.5%	25.0%
08/02 <sup>2</sup>	<i>Americamysis bahia</i>	10.23%	6.25%	12.5%
03/03 <sup>2</sup>	<i>Americamysis bahia</i>	28.4%	25.0%	50.0%
08/03 <sup>2</sup>	<i>Americamysis bahia</i>	43.2%	25.0%	50.0%
03/04 <sup>2</sup>	<i>Americamysis bahia</i>	>50.0%	50.0%	>50.0%
10/04 <sup>2</sup>	<i>Americamysis bahia</i>	>50.0%	50.0%	>50.0%
03/05 <sup>2</sup>	<i>Americamysis bahia</i>	48.5%	25.0%	50.0%
10/05 <sup>2</sup>	<i>Americamysis bahia</i>	>50.0%	50.0%	>50.0%
03/06 <sup>2</sup>	<i>Americamysis bahia</i>	36.6%	25%	50%
11/06 <sup>2</sup>	<i>Americamysis bahia</i>	43.1%	25%	50%

Notes:

<sup>1</sup>. Assays conducted by Advanced Biological Testing, Inc., Rohnert Park, California

<sup>2</sup>. Assays conducted by EnviroSystems, Inc., Hampton, New Hampshire

**APPENDIX A**  
**DATA SHEETS**  
**STATISTICAL SUPPORT**

Contents	Number of Pages
Methods Used in NPDES Permit Biomonitoring Testing	1
<i>A. bahia</i> Acute Bioassay Data Summary	3
<i>A. bahia</i> Survival Statistics: LC-50, NOEC	20
<i>A. bahia</i> Organism Culture Sheet	1
Preparation of Dilutions	1
Record of Meters Used for Water Quality Measurements	1
Unionized Ammonia Calculation	2
Sample Receipt Record	1
Chain of Custody	1
Total Appendix Pages	31

## METHODS USED IN NPDES PERMIT BIOMONITORING TESTING

Parameter	Method
<b>Acute Exposure Bioassays</b>	
<i>Ceriodaphnia dubia, Daphnia pulex</i>	EPA-821-R-02-012
<i>Pimephales promelas</i>	EPA-821-R-02-012
<i>Americamysis bahia</i>	EPA-821-R-02-012
<i>Menidia beryllina, Cyprinodon variegatus</i>	EPA-821-R-02-012
<b>Chronic Exposure Bioassays</b>	
<i>Ceriodaphnia dubia</i>	EPA-821-R-02-013, 1002.0
<i>Pimephales promelas</i>	EPA-821-R-02-013, 1000.0
<i>Cyprinodon variegatus</i>	EPA-821-R-02-014, 1004.0
<i>Menidia beryllina</i>	EPA-821-R-02-014, 1006.0
<i>Arbacia punctulata</i>	EPA-821-R-02-014, 1008.0
<i>Champia parvula</i>	EPA-821-R-02-014, 1009.0
<b>Trace Metals:</b>	
ICP Metals	EPA 200.7/SW 6010
Hardness	Standard Methods 20 <sup>th</sup> Edition - Method 2340 B
<b>Wet Chemistries:</b>	
Alkalinity	EPA 310.2
Chlorine, Residual	Standard Methods 20 <sup>th</sup> Edition - Method 4500CLD
Total Organic Carbon	Standard Methods 20 <sup>th</sup> Edition - Method 5310C
Specific Conductance	Standard Methods 20 <sup>th</sup> Edition - Method 2510B
Nitrogen - Ammonia	Standard Methods 20 <sup>th</sup> Edition - Method 4500NH3G
pH	Standard Methods 20 <sup>th</sup> Edition - Method 4500H+B
Solids, Total (TS)	Standard Methods 20 <sup>th</sup> Edition - Method 2540.B
Solids, Total Suspended (TSS)	Standard Methods 20 <sup>th</sup> Edition - Method 2540D
Dissolved Oxygen	Standard Methods 20 <sup>th</sup> Edition - Method 4500-O G

## ACUTE BIOASSAY DATA SUMMARY

STUDY: 1523A										"AS RECEIVED" EFFLUENT AND DILUENT CHEMISTRIES																				
CLIENT: CH2M Hill		TEST ORGANISM: A. bahia									TRC	AMM 0 HR*		AMM 48 HR*		pH	DO	Salinity												
SAMPLE: American Samoa		ORGANISM SUPPLIER/BATCH/AGE: <i>See Organism Culture Sheet</i>								EFFLUENT	See "EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA" sheet																			
DILUENT: LAB SALT										DILUENT																				
SALINITY ADJUSTMENT RECORD (IF APPLICABLE):										ML EFFLUENT +				G SEA SALTS =				100% ACTUAL PERCENTAGE												
CONC	REP	SURVIVAL					♦ DISSOLVED OXYGEN (MG/L) ♦						PH (SU)					TEMPERATURE (°C)						SALINITY (ppt)						
		0	24	48	72	96	0	24	480	48*	72	96	0	24	480	48*	72	96	0	24	480	48	72	96	0	24	480	48	72	96
LAB	A	10	10	10	9	9	74	85	7.0	6.8	7.0	7.5	770	769	7.94	7.61	7.85	7.65	20	20	20	20	20	20	25	25	28	25	26	27
	B	10	10	10	10	10	71	85	7.2	6.8	6.2	7.1	783	783	7.76	7.84	7.93	7.79	20	20	20	20	20	20	26	26	28	25	26	28
	C	10	10	10	10	10	71	84	7.2	6.8	6.8	7.1	7.80	7.90	7.71	7.89	7.90	7.83	20	20	20	20	20	20	26	26	30	26	27	28
	D	10	10	10	10	10	71	84	7.3	6.8	6.8	7.2	784	791	8.11	7.91	7.96	7.83	20	20	20	20	20	20	26	26	30	26	26	28
	E	10	10	10	10	10	71	84	7.1	6.9	7.0	7.1	781	792	8.18	7.90	7.90	7.65	20	20	20	20	20	20	26	26	30	26	27	28
6.25%	A	10	10	10	10	10	7.1	8.4	6.8	7.0	7.0	7.0	779	793	8.15	7.86	7.91	7.81	20	20	20	20	20	20	26	26	29	26	27	28
	B	10	10	10	10	10	7.1	8.4	6.8	6.9	6.9	7.0	780	783	8.23	7.88	7.90	7.83	20	20	20	26	20	20	26	26	28	25	27	28
	C	10	10	10	10	10	7.1	8.4	6.9	6.8	6.9	7.0	780	793	8.24	7.87	7.89	7.83	20	20	20	26	20	20	26	26	29	26	27	28
	D	10	10	10	10	10	7.1	8.4	7.0	6.8	6.9	7.1	780	793	8.26	7.91	7.90	7.78	20	20	20	20	20	20	26	26	29	25	27	28
	E	10	10	10	10	10	7.1	8.4	6.0	6.8	6.9	7.1	7.80	7.92	5.38	7.90	7.93	7.87	20	20	20	20	20	20	26	26	29	26	27	28
DATE	11/6	11/7	11/8	11/9	11/20	11/6	11/7	11/8*	11/8	11/19	11/20																			
TIME	1450	1330	1450	1545	1330	1550	1330	1630	1410	1515	1530																			
INITIALS	CS	CS	YV	SJ	CS	CS	CS	YV	YV	SJ	CS																			
FED?	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																			

\* - See: "EFFLUENT &amp; DILUENT CHEMISTRY and WATER QUALITY DATA" sheet.

♦ - AERATE PRIOR TO MIXING DILUTIONS - AERATE TEST CHAMBERS FROM START!

◊ - "Old" water qualities (prior to renewal)

☆ - "New" water qualities (post renewal)

## ACUTE BIOASSAY DATA SUMMARY

STUDY:			SAMPLE RECEIVED:								"AS RECEIVED" EFFLUENT AND DILUENT CHEMISTRIES																			
CLIENT: CH2M Hill			TEST ORGANISM: A. bahia								TRC		AMM 0 HR*		AMM 48 HR*		pH	DO	Salinity											
SAMPLE: American Samoa			ORGANISM SUPPLIER:								EFFLUENT		See "EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA" sheet																	
DILUENT: LAB SALT			ORGANISM BATCH/AGE:								DILUENT																			
CONC	REP	SURVIVAL				♦DISSOLVED OXYGEN (MG/L)♦								PH (SU)				TEMPERATURE (°C)				SALINITY (ppt)								
		0	24	48	72	96	0	24	480	48☆	72	96	0	24	480	48☆	72	96	0	24	480	48	72	96						
12.5%	A	10	10	10	10	10	6.5	8.6	6.5	6.6	6.7	7.1	7.70	7.65	7.82	7.89	7.75	7.89	20	20	26	20	20	20	25	26	30	26	27	28
	B	10	10	10	10	10	7.1	8.6	6.6	6.4	6.5	7.1	7.70	7.68	7.91	7.87	7.74	7.66	20	20	20	20	20	20	25	26	29	26	27	28
	C	10	10	10	10	10	7.1	8.3	6.7	6.6	6.6	7.1	7.70	7.68	7.96	7.90	7.76	7.82	20	20	20	20	20	20	25	26	28	26	27	28
	D	10	10	10	10	10	7.1	8.3	6.9	6.4	6.6	7.1	7.69	7.68	7.98	7.91	7.77	7.94	20	20	20	20	20	20	25	26	29	26	27	28
	E	10	10	10	10	10	7.1	8.3	6.9	6.7	6.7	7.1	7.89	7.69	7.82	7.91	7.77	7.56	20	20	20	20	20	20	25	26	29	26	27	28
25%	A	10	10	10	10	8	7.1	8.5	7.0	6.5	6.7	7.3	7.71	7.60	7.90	7.88	7.81	7.95	20	20	20	20	20	20	25	26	30	26	28	28
	B	10	10	10	10	9	7.0	7.8	6.6	6.5	6.4	7.3	7.71	7.68	7.95	7.86	7.84	7.98	20	20	20	20	20	20	25	26	29	26	27	28
	C	10	10	10	10	8	7.0	7.4	6.8	6.4	6.4	7.2	7.71	7.62	7.96	7.87	7.86	7.98	20	20	20	20	20	20	25	26	28	26	27	28
	D	10	10	10	10	10	7.0	7.3	6.2	6.3	6.4	7.1	7.71	7.68	8.05	7.90	7.89	7.94	20	20	20	20	20	20	25	26	28	26	27	28
	E	10	10	9	9	9	7.0	7.1	6.6	6.3	6.4	6.6	7.71	7.68	7.81	7.93	7.91	7.92	20	20	20	20	20	20	25	26	28	26	27	28
50%	A	10	10	10	10	8	7.0	6.6	6.8	6.3	6.3	6.8	7.59	7.96	7.99	7.92	8.02	8.03	20	20	20	20	20	20	25	26	28	26	27	28
	B	10	7	7	6	3	7.0	5.9	6.7	6.3	6.1	6.8	7.59	7.90	7.94	7.94	8.03	8.07	20	20	20	20	20	20	25	26	28	26	27	28
	C	10	6	6	6	4	7.0	6.4	6.8	6.4	6.2	6.6	7.59	7.95	8.08	7.95	8.04	8.12	20	20	20	20	20	20	25	26	29	26	27	28
	D	10	8	9	8	5	7.0	6.4	6.8	6.3	6.2	6.7	7.59	7.97	8.11	7.94	8.04	8.09	20	20	20	20	20	20	25	26	28	26	27	28
	E	10	4	3	3	3	7.0	6.3	6.8	6.4	6.1	6.6	7.51	7.90	8.08	7.94	8.02	8.08	20	20	20	20	20	20	25	26	29	26	27	28
DATE		11/16	11/17	11/18	11/19	11/20	11/16	11/17	11/18	11/19	11/19	11/20																		
TIME		1562	1330	1450	1515	1325	1450	1430	1400	1515	1530	1320																		
INITIALS		CS	CS	YH	SJ	CS	CS	CS	YH	YH	SJ	CS																		
FED?		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																		

\* - See: "EFFLUENT &amp; DILUENT CHEMISTRY and WATER QUALITY DATA" sheet.

♦ - AERATE PRIOR TO MIXING DILUTIONS - AERATE TEST CHAMBERS FROM START!

◊ - "Old" water qualities (prior to renewal)

☆ - "New" water qualities (post renewal)

# ACUTE BIOASSAY DATA SUMMARY

STUDY:		SAMPLE RECEIVED:						"AS RECEIVED" EFFLUENT AND DILUENT CHEMISTRIES																							
CLIENT: CH2M Hill		TEST ORGANISM: A. bahia								TRC	AMM 0 HR*	AMM 48 HR*	pH	DO	Salinity																
SAMPLE: American Samoa		ORGANISM SUPPLIER:						EFFLUENT		See "EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA" sheet																					
DILUENT: LAB SALT		ORGANISM BATCH/AGE:						DILUENT																							
CONC	REP	SURVIVAL						♦ DISSOLVED OXYGEN (MG/L)♦						PH (SU)						TEMPERATURE (°C)						SALINITY (ppt)					
		0	24	48	72	96	0	24	48◊	48★	72	96	0	24	48◊	48★	72	96	0	24	48◊	48★	72	96	0	24	48◊	48★	72	96	
75%	A	10	-	-	-	-	70	54	-	-	-	7.91	7.88	-	-	-	-	20	20	20	20	-	-	-	25	26	28	-	-	-	
	B	10	-	-	-	-	7.0	54	-	-	-	7.92	7.88	-	-	-	-	20	20	20	20	-	-	-	25	26	28	-	-	-	
	C	10	3	2	0	-	6.9	5.0	7.0	6.0	6.2	-	7.93	7.91	8.30	7.93	8.21	-	20	20	20	20	20	-	-	25	26	28	27	27	-
	D	10	2	0	-	-	7.0	4.4	6.8	-	-	-	7.94	7.89	8.32	-	-	-	20	20	20	-	-	-	-	25	26	28	-	-	-
	E	10	1	0	-	-	7.1	4.4	6.8	-	-	-	7.95	7.91	8.32	-	-	-	20	20	20	-	-	-	-	25	26	28	29	-	-
100%	A	10	-	-	-	-	7.1	4.9	-	-	-	7.98	7.95	-	-	-	-	20	20	-	-	-	-	-	25	26	-	-	-	-	
	B	10	1	0	-	-	7.0	54	6.5	5.8	6.0	6.3	7.98	7.92	8.34	7.95	8.24	8.16	20	20	20	20	20	20	20	25	26	29	27	27	2
	C	10	-	-	-	-	7.1	5.0	-	-	-	-	7.98	7.90	-	-	-	-	20	20	-	-	-	-	-	25	26	-	-	-	-
	D	10	-	-	-	-	7.1	3.1	-	-	-	-	7.99	7.91	-	-	-	-	20	20	-	-	-	-	-	25	26	-	-	-	-
	E	10	-	-	-	-	7.0	4.4	-	-	-	-	7.98	7.91	-	-	-	-	20	20	-	-	-	-	-	25	26	-	-	-	-
DATE		11/16	11/17	11/18	11/19	11/20	11/16	11/17	11/18	11/19	11/20																				
TIME		1510	1350	1455	1450	1318	1450	1430	1440	1355	1530	1328																			
INITIALS		CS	CS	y	SJ	CS	CS	CS	CS	y	y	SJ	CS																		
FED?		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			

\* - See: "EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA" sheet.

◊ - AERATE PRIOR TO MIXING DILUTIONS - AERATE TEST CHAMBERS FROM START!

◊ - "Old" water qualities (prior to renewal)      ★ - "New" water qualities (post renewal)

KEEP @ 20°

## CETIS Test Summary

Americamysis 96-h Acute Survival Test					EnviroSystems, Inc.	
Test No:	02-8774-5143	Test Type:	Survival (96h)	Duration:	95h	
Start Date:	16 Nov-06 02:50 PM	Protocol:	EPA/821/R-02-012 (2002)	Species:	Americamysis bahia	
Ending Date:	20 Nov-06 01:30 PM	Dil Water:	Laboratory Seawater	Source:	ARO - Aquatic Research Organisms, N	
Setup Date:	16 Nov-06 02:50 PM	Brine:	Generic commercial salts			
Sample No:	13-8429-9146	Material:	Food Processing Effluent	Client:	CH2M Hill	
Sample Date:	08 Nov-06 12:00 PM	Code:	15231	Project:	Fourth Quarter WET Compliance Test	
Receive Date:	16 Nov-06 12:00 PM	Source:	CH2M Hill- American Samoa			
Sample Age:	8d 2h (17.6 °C)	Station:	Joint Cannery Outfall			
<b>Comparison Summary</b>						
Analysis	Endpoint	NOEL	LOEL	ChV	MSDp	Method
15-1861-6061	24h Proportion Survived	50	75	61.237	12.49%	Steel's Many-One Rank
05-3366-0403	48h Proportion Survived	50	75	61.237	13.57%	Steel's Many-One Rank
12-3031-9286	72h Proportion Survived	50	75	61.237	13.65%	Steel's Many-One Rank
13-2392-7726	96h Proportion Survived	25	50	35.355	10.03%	Steel's Many-One Rank
15-3946-9841		25	50	35.355	10.03%	Steel's Many-One Rank
<b>Point Estimate Summary</b>						
Analysis	Endpoint	% Effect	Conc-%	95% LCL	95% UCL	Method
05-8103-0502	24h Proportion Survived	50	57.41013	53.16588	61.33142	Linear Regression
15-6516-5191	24h Proportion Survived	50	55.08024	50.85098	59.66126	Trimmed Spearman-Karber
13-5582-5949	48h Proportion Survived	50	53.20215	39.83447	62.59899	Linear Regression
11-6781-2753	48h Proportion Survived	50	51.93348	48.00367	56.18501	Trimmed Spearman-Karber
07-1526-2296	72h Proportion Survived	50	50.45696	46.72910	54.48220	Trimmed Spearman-Karber
06-6921-1005	96h Proportion Survived	50	43.53077	38.96288	47.80206	Linear Regression
13-8136-4302	96h Proportion Survived	50	43.07151	38.98845	47.58219	Trimmed Spearman-Karber
<b>Test Acceptability</b>						
Analysis	Endpoint	Attribute	Statistic	Acceptable Range	Decision	
06-6921-1005	96h Proportion Survived	Control Response	0.98	0.9 - N/A	Passes acceptability criteria	
13-2392-7726	96h Proportion Survived	Control Response	0.98	0.9 - N/A	Passes acceptability criteria	
13-8136-4302	96h Proportion Survived	Control Response	0.98	0.9 - N/A	Passes acceptability criteria	
15-3946-9841	96h Proportion Survived	Control Response	0.98	0.9 - N/A	Passes acceptability criteria	

## CETIS Test Summary

## 24h Proportion Survived Summary

Conc-%	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Lab Water	5	1.00000	1.00000	1.00000	0.00000	0.00000	0.00%
6.25		5	1.00000	1.00000	1.00000	0.00000	0.00000	0.00%
12.5		5	1.00000	1.00000	1.00000	0.00000	0.00000	0.00%
25		5	1.00000	1.00000	1.00000	0.00000	0.00000	0.00%
50		5	0.72000	0.40000	1.00000	0.10677	0.23875	33.16%
75		5	0.12000	0.00000	0.30000	0.05831	0.13038	108.65
100		5	0.02000	0.00000	0.10000	0.02000	0.04472	223.61

## 48h Proportion Survived Summary

Conc-%	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Lab Water	5	1.00000	1.00000	1.00000	0.00000	0.00000	0.00%
6.25		5	1.00000	1.00000	1.00000	0.00000	0.00000	0.00%
12.5		5	1.00000	1.00000	1.00000	0.00000	0.00000	0.00%
25		5	0.98000	0.90000	1.00000	0.02000	0.04472	4.56%
50		5	0.70000	0.30000	1.00000	0.12247	0.27386	39.12%
75		5	0.04000	0.00000	0.20000	0.04000	0.08944	223.61
100		5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00%

## 72h Proportion Survived Summary

Conc-%	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Lab Water	5	0.98000	0.90000	1.00000	0.02000	0.04472	4.56%
6.25		5	1.00000	1.00000	1.00000	0.00000	0.00000	0.00%
12.5		5	1.00000	1.00000	1.00000	0.00000	0.00000	0.00%
25		5	0.98000	0.90000	1.00000	0.02000	0.04472	4.56%
50		5	0.66000	0.30000	1.00000	0.11662	0.26077	39.51%
75		5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00%
100		5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00%

## 96h Proportion Survived Summary

Conc-%	Control Type	Reps	Mean	Minimum	Maximum	SE	SD	CV
0	Lab Water	5	0.98000	0.90000	1.00000	0.02000	0.04472	4.56%
6.25		5	1.00000	1.00000	1.00000	0.00000	0.00000	0.00%
12.5		5	1.00000	1.00000	1.00000	0.00000	0.00000	0.00%
25		5	0.88000	0.80000	1.00000	0.03742	0.08367	9.51%
50		5	0.50000	0.30000	0.80000	0.08367	0.18708	37.42%
75		5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00%
100		5	0.00000	0.00000	0.00000	0.00000	0.00000	0.00%

## CETIS Test Summary

## 24h Proportion Survived Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
0	Lab Water	1.00000	1.00000	1.00000	1.00000	1.00000
6.25		1.00000	1.00000	1.00000	1.00000	1.00000
12.5		1.00000	1.00000	1.00000	1.00000	1.00000
25		1.00000	1.00000	1.00000	1.00000	1.00000
50		1.00000	0.70000	0.60000	0.90000	0.40000
75		0.00000	0.00000	0.30000	0.20000	0.10000
100		0.00000	0.10000	0.00000	0.00000	0.00000

## 48h Proportion Survived Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
0	Lab Water	1.00000	1.00000	1.00000	1.00000	1.00000
6.25		1.00000	1.00000	1.00000	1.00000	1.00000
12.5		1.00000	1.00000	1.00000	1.00000	1.00000
25		1.00000	1.00000	1.00000	1.00000	0.90000
50		1.00000	0.70000	0.60000	0.90000	0.30000
75		0.00000	0.00000	0.20000	0.00000	0.00000
100		0.00000	0.00000	0.00000	0.00000	0.00000

## 72h Proportion Survived Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
0	Lab Water	0.90000	1.00000	1.00000	1.00000	1.00000
6.25		1.00000	1.00000	1.00000	1.00000	1.00000
12.5		1.00000	1.00000	1.00000	1.00000	1.00000
25		1.00000	1.00000	1.00000	1.00000	0.90000
50		1.00000	0.60000	0.60000	0.80000	0.30000
75		0.00000	0.00000	0.00000	0.00000	0.00000
100		0.00000	0.00000	0.00000	0.00000	0.00000

## 96h Proportion Survived Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5
0	Lab Water	0.90000	1.00000	1.00000	1.00000	1.00000
6.25		1.00000	1.00000	1.00000	1.00000	1.00000
12.5		1.00000	1.00000	1.00000	1.00000	1.00000
25		0.80000	0.90000	0.80000	1.00000	0.90000
50		0.80000	0.30000	0.40000	0.50000	0.50000
75		0.00000	0.00000	0.00000	0.00000	0.00000
100		0.00000	0.00000	0.00000	0.00000	0.00000

# CETIS Analysis Detail

Comparisons:

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Report Date:

21 Nov-06 9:13 PM

Analysis:

05-3366-0403

Americamysis 96-h Acute Survival Test							EnviroSystems, Inc.		
Endpoint	Analysis Type		Sample Link	Control Link	Date Analyzed	Version			
48h Proportion Survived	Comparison		06-1931-8785	06-1931-8785	21 Nov-06 9:12 PM	CETISv1.026			
Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp	
Steel's Many-One Rank	C > T	Angular (Corrected)		50	75	2.00	61.237	13.57%	
<b>ANOVA Assumptions</b>									
Attribute	Test	Statistic	Critical	P Level	Decision(0.01)				
Variances	Modified Levene	9.04822	3.89507	0.00006	Unequal Variances				
Distribution	Shapiro-Wilk W	0.75923	0.89981	0.00000	Non-normal Distribution				
<b>ANOVA Table</b>									
Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)			
Between	5.698237	1.139647	5	53.18	0.00000	Significant Effect			
Error	0.5143614	0.0214317	24						
Total	6.21259886	1.1610792	29						
<b>Group Comparisons</b>									
Control	vs	Conc-%	Statistic	Critical	P Level	Ties	Decision(0.05)		
Lab Water	6.25	27.5	16	> 0.0500	1		Non-Significant Effect		
	12.5	27.5	16	> 0.0500	1		Non-Significant Effect		
	25	25	16	> 0.0500	1		Non-Significant Effect		
	50	17.5	16	> 0.0500	1		Non-Significant Effect		
	75	15	16	<= 0.0500	2		Significant Effect		
<b>Data Summary</b>									
			Original Data				Transformed Data		
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	
0	Lab Water	5	1.00000	1.00000	1.00000	0.00000	1.41202	1.41202	
6.25		5	1.00000	1.00000	1.00000	0.00000	1.41202	1.41202	
12.5		5	1.00000	1.00000	1.00000	0.00000	1.41202	1.41202	
25		5	0.98000	0.90000	1.00000	0.04472	1.37942	1.24905	
50		5	0.70000	0.30000	1.00000	0.27386	1.02359	0.57964	
75		5	0.04000	0.00000	0.20000	0.08944	0.21975	0.15878	
<b>Data Detail</b>									
Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	
0	Lab Water	1.00000	1.00000	1.00000	1.00000	1.00000			
6.25		1.00000	1.00000	1.00000	1.00000	1.00000			
12.5		1.00000	1.00000	1.00000	1.00000	1.00000			
25		1.00000	1.00000	1.00000	1.00000	0.90000			
50		1.00000	0.70000	0.60000	0.90000	0.30000			
75		0.00000	0.00000	0.20000	0.00000	0.00000			

# CETIS Analysis Detail

Comparisons:

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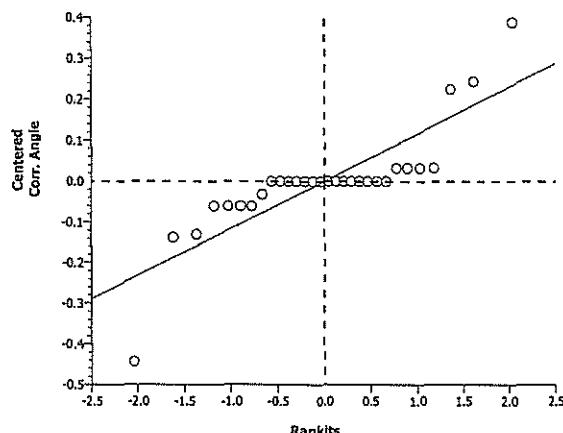
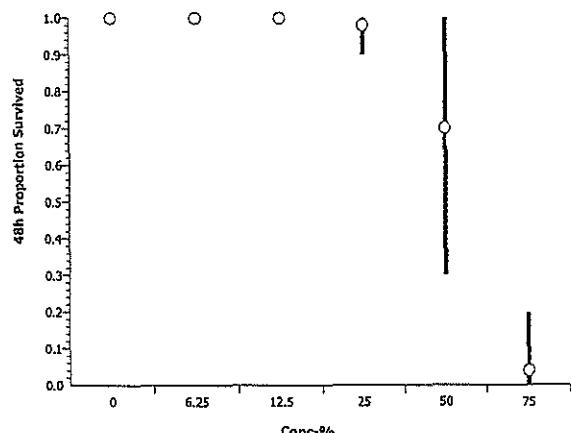
Report Date:

21 Nov-06 9:13 PM

Analysis:

05-3366-0403

## Graphics



## CETIS Analysis Detail

## Americamysis 96-h Acute Survival Test

EnviroSystems, Inc.

Endpoint	Analysis Type	Sample Link	Control Link	Date Analyzed	Version			
72h Proportion Survived	Comparison	06-1931-8785	06-1931-8785	21 Nov-06 9:12 PM	CETISv1.026			
Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp
Steel's Many-One Rank	C > T	Angular (Corrected)		50	75	2.00	61.237	13.65%

## ANOVA Assumptions

Attribute	Test	Statistic	Critical	P Level	Decision(0.01)
Variances	Modified Levene	5.90270	4.43069	0.00264	Unequal Variances
Distribution	Shapiro-Wilk W	0.73563	0.88746	0.00001	Non-normal Distribution

## ANOVA Table

Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)
Between	0.7160529	0.1790132	4	8.46	0.00036	Significant Effect
Error	0.4230623	0.0211531	20			
Total	1.13911527	0.2001664	24			

## Group Comparisons

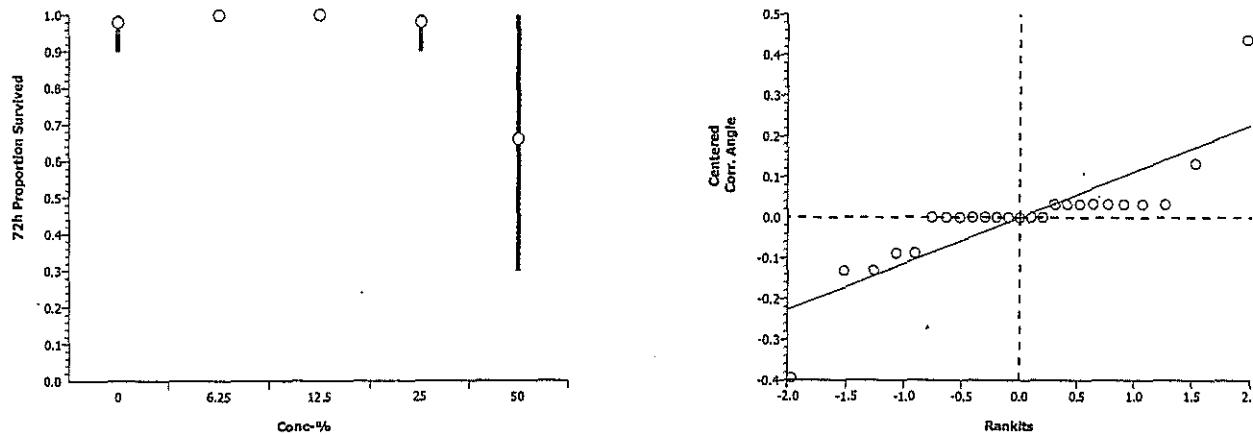
Control	vs	Conc-%	Statistic	Critical	P Level	Ties	Decision(0.05)
Lab Water		6.25	30	17	> 0.0500	1	Non-Significant Effect
		12.5	30	17	> 0.0500	1	Non-Significant Effect
		25	27.5	17	> 0.0500	2	Non-Significant Effect
		50	18	17	> 0.0500	2	Non-Significant Effect

Conc-%	Control Type	Count	Original Data				Transformed Data			
			Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD
0	Lab Water	5	0.98000	0.90000	1.00000	0.04472	1.37942	1.24905	1.41202	0.07288
6.25		5	1.00000	1.00000	1.00000	0.00000	1.41202	1.41202	1.41202	0.00026
12.5		5	1.00000	1.00000	1.00000	0.00000	1.41202	1.41202	1.41202	0.00026
25		5	0.98000	0.90000	1.00000	0.04472	1.37942	1.24905	1.41202	0.07288
50		5	0.66000	0.30000	1.00000	0.26077	0.97419	0.57964	1.41202	0.30845

## Data Detail

Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water	0.90000	1.00000	1.00000	1.00000	1.00000					
6.25		1.00000	1.00000	1.00000	1.00000	1.00000					
12.5		1.00000	1.00000	1.00000	1.00000	1.00000					
25		1.00000	1.00000	1.00000	1.00000	0.90000					
50		1.00000	0.60000	0.60000	0.80000	0.30000					

## Graphics



# CETIS Analysis Detail

Americamysis 96-h Acute Survival Test							EnviroSystems, Inc.				
Endpoint	Analysis Type		Sample Link	Control Link	Date Analyzed	Version					
96h Proportion Survived	Comparison		06-1931-8785	06-1931-8785	21 Nov-06 9:12 PM	CETISv1.026					
Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp			
Steel's Many-One Rank	C > T	Angular (Corrected)		25	50	4.00	35.355	10.03%			
<b>Test Acceptability</b>											
Attribute	Statistic	Acceptable Range	Decision								
Control Response	0.98	0.9 - N/A	Passes acceptability criteria								
<b>ANOVA Assumptions</b>											
Attribute	Test	Statistic	Critical	P Level	Decision(0.01)						
Variances	Modified Levene	4.98442	4.43069	0.00594	Unequal Variances						
Distribution	Shapiro-Wilk W	0.79951	0.88746	0.00012	Non-normal Distribution						
<b>ANOVA Table</b>											
Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)					
Between	1.413387	0.3533468	4	29.31	0.00000	Significant Effect					
Error	0.241106	0.0120553	20								
Total	1.65449303	0.3654021	24								
<b>Group Comparisons</b>											
Control	vs Conc-%	Statistic	Critical	P Level	Ties	Decision(0.05)					
Lab Water	6.25	30	17	> 0.0500	1	Non-Significant Effect					
	12.5	30	17	> 0.0500	1	Non-Significant Effect					
	25	19	17	> 0.0500	3	Non-Significant Effect					
	50	15	17	<= 0.0500	2	Significant Effect					
<b>Data Summary</b>											
Conc-%			Original Data				Transformed Data				
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD	
0	Lab Water	5	0.98000	0.90000	1.00000	0.04472	1.37942	1.24905	1.41202	0.07288	
6.25		5	1.00000	1.00000	1.00000	0.00000	1.41202	1.41202	1.41202	0.00026	
12.5		5	1.00000	1.00000	1.00000	0.00000	1.41202	1.41202	1.41202	0.00026	
25		5	0.88000	0.80000	1.00000	0.08367	1.22488	1.10715	1.41202	0.12640	
50		5	0.50000	0.30000	0.80000	0.18708	0.78846	0.57964	1.10715	0.19745	
<b>Data Detail</b>											
Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water	0.90000	1.00000	1.00000	1.00000	1.00000					
6.25		1.00000	1.00000	1.00000	1.00000	1.00000					
12.5		1.00000	1.00000	1.00000	1.00000	1.00000					
25		0.80000	0.90000	0.80000	1.00000	0.90000					
50		0.80000	0.30000	0.40000	0.50000	0.50000					

# CETIS Analysis Detail

Comparisons:

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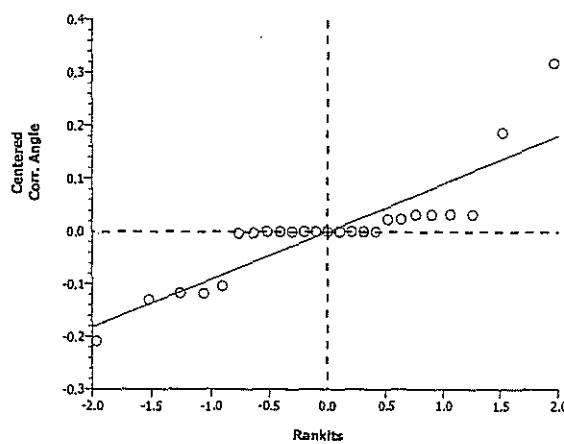
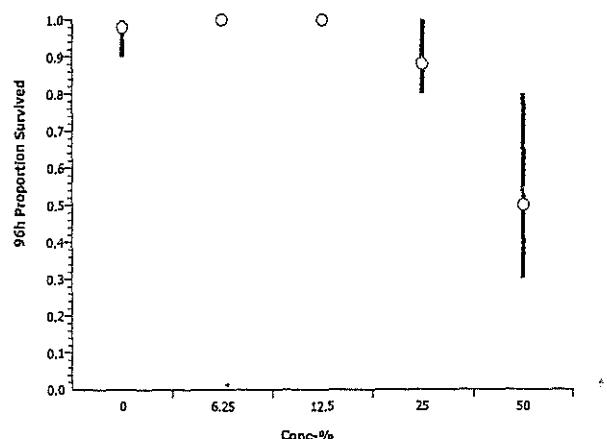
Report Date:

21 Nov-06 9:13 PM

Analysis:

13-2392-7726

## Graphics



# CETIS Analysis Detail

Americamysis 96-h Acute Survival Test							EnviroSystems, Inc.				
Endpoint	Analysis Type		Sample Link	Control Link	Date Analyzed	Version					
24h Proportion Survived	Comparison		06-1931-8785	06-1931-8785	21 Nov-06 9:12 PM	CETISv1.026					
Method	Alt H	Data Transform	Z	NOEL	LOEL	Toxic Units	ChV	MSDp			
Steel's Many-One Rank	C > T	Angular (Corrected)		50	75	2.00	61.237	12.49%			
ANOVA Assumptions											
Attribute	Test	Statistic	Critical	P Level	Decision(0.01)						
Variances	Modified Levene	19.01480	3.52756	0.00000	Unequal Variances						
Distribution	Shapiro-Wilk W	0.79103	0.91004	0.00001	Non-normal Distribution						
ANOVA Table											
Source	Sum of Squares	Mean Square	DF	F Statistic	P Level	Decision(0.05)					
Between	8.840754	1.473459	6	83.48	0.00000	Significant Effect					
Error	0.4942097	0.0176504	28								
Total	9.33496323	1.4911092	34								
Group Comparisons											
Control	vs	Conc-%	Statistic	Critical	P Level	Ties	Decision(0.05)				
Lab Water	6.25	27.5	16	> 0.0500	1		Non-Significant Effect				
	12.5	27.5	16	> 0.0500	1		Non-Significant Effect				
	25	27.5	16	> 0.0500	1		Non-Significant Effect				
	50	17.5	16	> 0.0500	1		Non-Significant Effect				
	75	15	16	<= 0.0500	2		Significant Effect				
	100	15	16	<= 0.0500	2		Significant Effect				
Data Summary											
Original Data			Transformed Data								
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SD	Mean	Minimum	Maximum	SD	
0	Lab Water	5	1.00000	1.00000	1.00000	0.00000	1.41202	1.41202	1.41202	0.00026	
6.25		5	1.00000	1.00000	1.00000	0.00000	1.41202	1.41202	1.41202	0.00026	
12.5		5	1.00000	1.00000	1.00000	0.00000	1.41202	1.41202	1.41202	0.00026	
25		5	1.00000	1.00000	1.00000	0.00000	1.41202	1.41202	1.41202	0.00026	
50		5	0.72000	0.40000	1.00000	0.23875	1.04460	0.68472	1.41202	0.28909	
75		5	0.12000	0.00000	0.30000	0.13038	0.33652	0.15878	0.57964	0.18619	
100		5	0.02000	0.00000	0.10000	0.04472	0.19137	0.15878	0.32175	0.07288	
Data Detail											
Conc-%	Control Type	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	Lab Water	1.00000	1.00000	1.00000	1.00000	1.00000					
6.25		1.00000	1.00000	1.00000	1.00000	1.00000					
12.5		1.00000	1.00000	1.00000	1.00000	1.00000					
25		1.00000	1.00000	1.00000	1.00000	1.00000					
50		1.00000	0.70000	0.60000	0.90000	0.40000					
75		0.00000	0.00000	0.30000	0.20000	0.10000					
100		0.00000	0.10000	0.00000	0.00000	0.00000					

# CETIS Analysis Detail

Comparisons:

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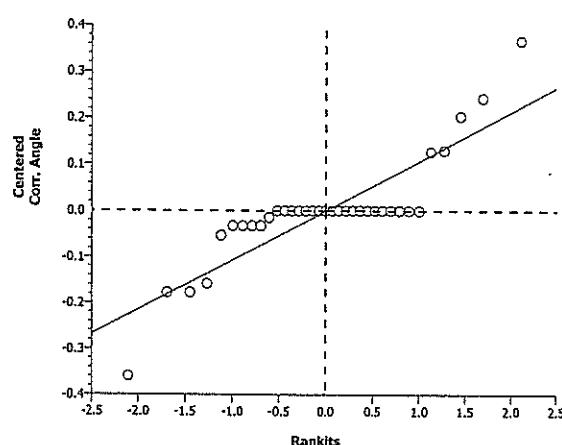
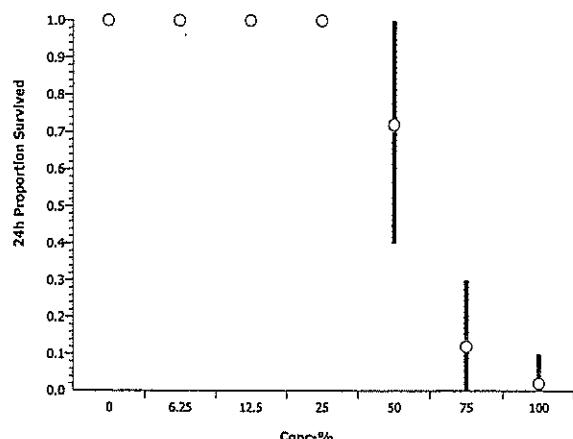
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21 Nov-06 9:13 PM

Analysis:

15-1861-6061

## Graphics

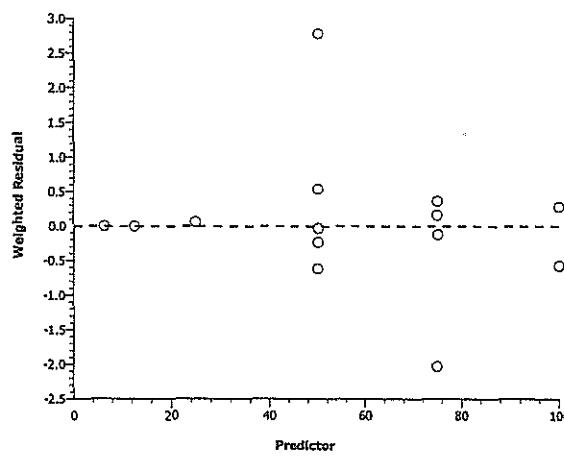
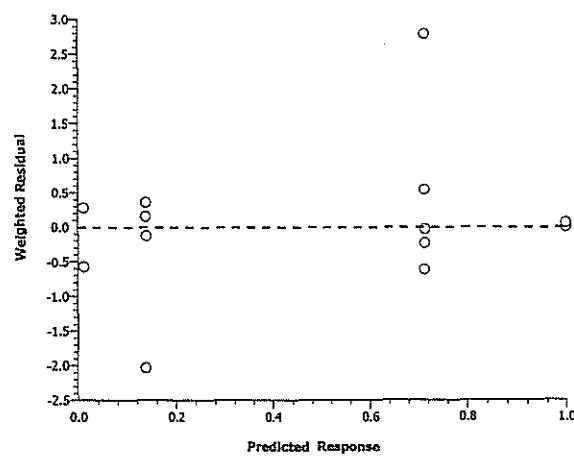
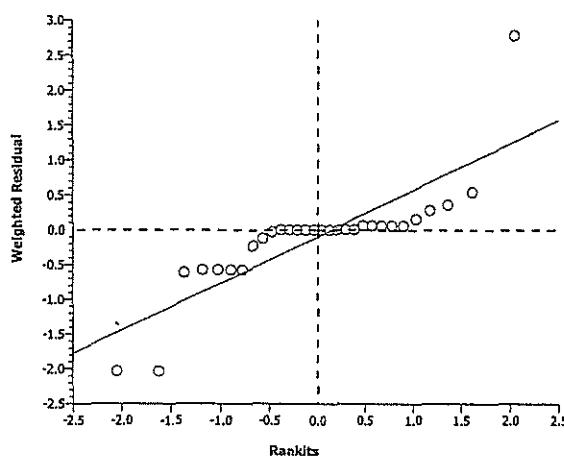
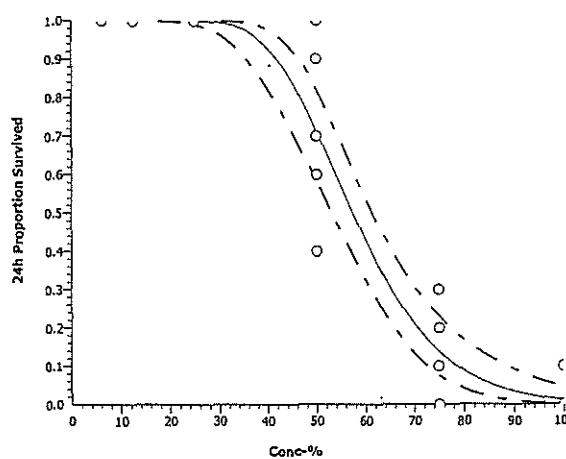


# CETIS Analysis Detail

Americamysis 96-h Acute Survival Test						EnviroSystems, Inc.			
Endpoint	Analysis Type		Sample Link	Control Link	Date Analyzed	Version			
24h Proportion Survived	Linear Regression		06-1931-8785	06-1931-8785	21 Nov-06 9:11 PM	CETISv1.026			
<b>Linear Regression Options</b>									
Model	Threshold Option	Lower Threshold	Threshold Optimized	Reweighted	Pooled Groups	Heterogeneity Corr.			
Log-Normal	Control Threshold	0	Yes	Yes	No	No			
<b>Regression Parameters</b>									
Parameter	Estimate	Std Error	95% LCL	95% UCL	t Statistic	P Level	Decision(0.05)		
Slope	9.37093	1.29079	6.84099	11.90087	7.260	0.00191	Significant		
Intercept	-11.48335	2.31281	-16.01647	-6.95024	-4.965	0.00768	Significant		
<b>Regression Summary</b>									
Iters	Log Likelihood	Mu	Sigma	G Stat	Chi-Sq	Critical	P Level	Decision(0.05)	
5	-24.62203	-1.22542	0.10671	0.07289	24.06445	41.33714	0.67813	Non-Significant Heterogeneity	
<b>Residual Analysis</b>									
Attribute	Method	Statistic		Critical	P Level	Decision(0.05)			
Variances	Modified Levene	3.58441		2.52766	0.01178	Unequal Variances			
Distribution	Shapiro-Wilk W	0.82077		0.92671	0.00011	Non-normal Distribution			
<b>Point Estimates</b>									
% Effect	Conc-%	95% LCL	95% UCL						
50	57.41013	53.16588	61.33142						
<b>Data Summary</b>									
Calculated Variate(A/B)									
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SE	SD	A	B
0	Lab Water	5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
6.25		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
12.5		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
25		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
50		5	0.72000	0.40000	1.00000	0.04873	0.23875	36	50
75		5	0.12000	0.00000	0.30000	0.02661	0.13038	6	50
100		5	0.02000	0.00000	0.10000	0.00913	0.04472	1	50

## CETIS Analysis Detail

## Graphics

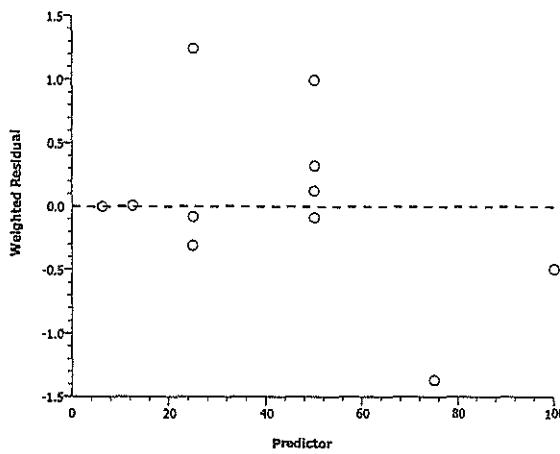
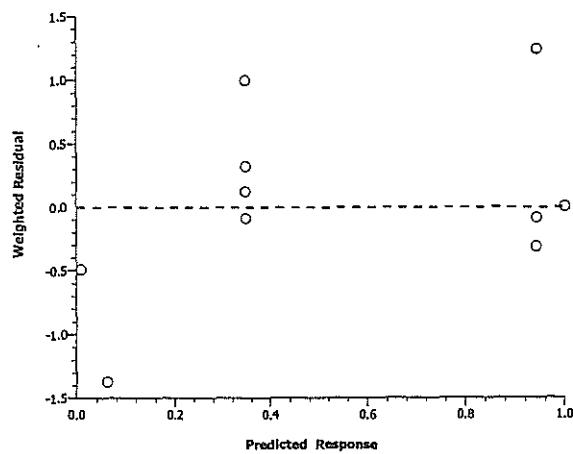
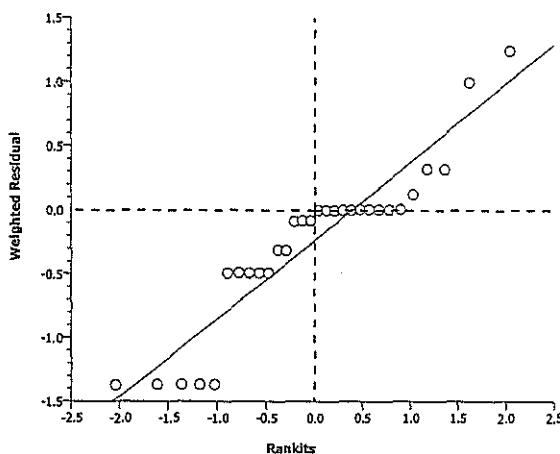
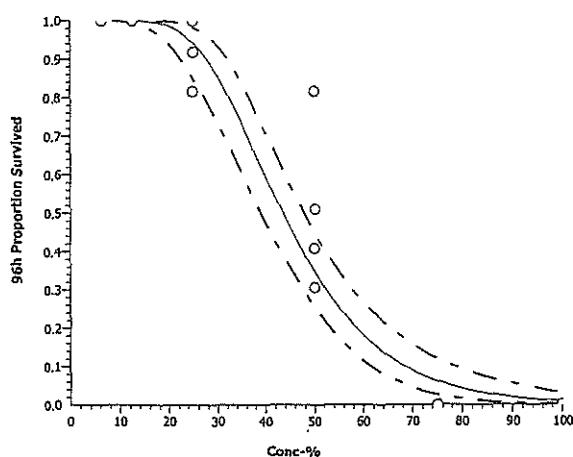


# CETIS Analysis Detail

Americamysis 96-h Acute Survival Test							EnviroSystems, Inc.		
Endpoint	Analysis Type		Sample Link	Control Link	Date Analyzed	Version			
96h Proportion Survived	Linear Regression		06-1931-8785	06-1931-8785	21 Nov-06 9:11 PM	CETISv1.026			
<b>Linear Regression Options</b>									
Model	Threshold Option	Lower Threshold	Threshold Optimized	Reweighted	Pooled Groups	Heterogeneity Corr.			
Log-Normal	Control Threshold	0.02	Yes	Yes	No	No			
<b>Regression Parameters</b>									
Parameter	Estimate	Std Error	95% LCL	95% UCL	t Statistic	P Level	Decision(0.05)		
Threshold	0.00854	0.00754	-0.00624	0.02333	1.133	0.32062	Not Significant		
Slope	6.53362	0.78549	4.99405	8.07318	8.318	0.00114	Significant		
Intercept	-5.70727	1.34135	-8.33631	-3.07823	-4.255	0.01311	Significant		
<b>Regression Summary</b>									
Iters	Log Likelihood	Mu	Sigma	G Stat	Chi-Sq	Critical	P Level	Decision(0.05)	
10	-18.86726	-0.87352	0.15305	0.05552	23.08905	41.33714	0.72857	Non-Significant Heterogeneity	
<b>Residual Analysis</b>									
Attribute	Method		Statistic	Critical	P Level	Decision(0.05)			
Variances	Modified Levene		2.59015	2.52766	0.04575	Unequal Variances			
Distribution	Shapiro-Wilk W		0.59985	0.92671	0.00000	Non-normal Distribution			
<b>Test Acceptability</b>									
Attribute	Statistic		Acceptable Range		Decision				
Control Response	0.98		0.9 - N/A		Passes acceptability criteria				
<b>Point Estimates</b>									
% Effect	Conc-%	95% LCL	95% UCL						
50	43.53077	38.96288	47.80206						
<b>Data Summary</b>									
Calculated Variate(A/B)									
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SE	SD	A	B
0	Lab Water	5	0.98000	0.90000	1.00000	0.00913	0.04472	49	50
6.25		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
12.5		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
25		5	0.88000	0.80000	1.00000	0.01708	0.08367	44	50
50		5	0.50000	0.30000	0.80000	0.03819	0.18708	25	50
75		5	0.00000	0.00000	0.00000	0.00000	0.00000	0	50
100		5	0.00000	0.00000	0.00000	0.00000	0.00000	0	50

# CETIS Analysis Detail

## Graphics



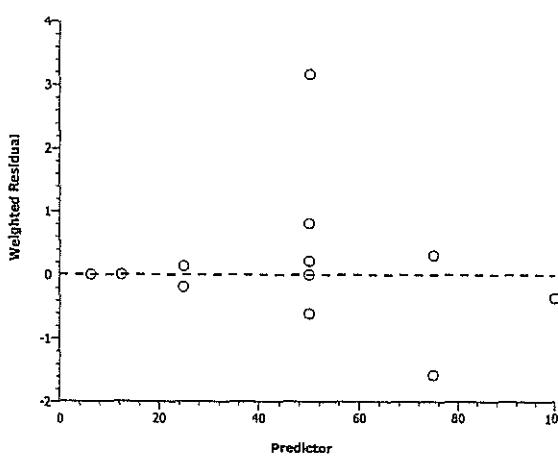
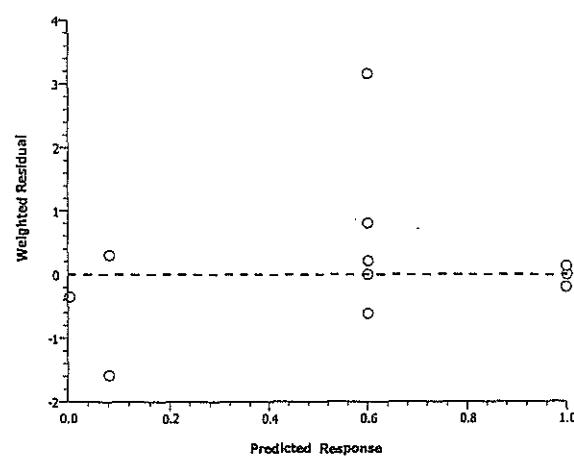
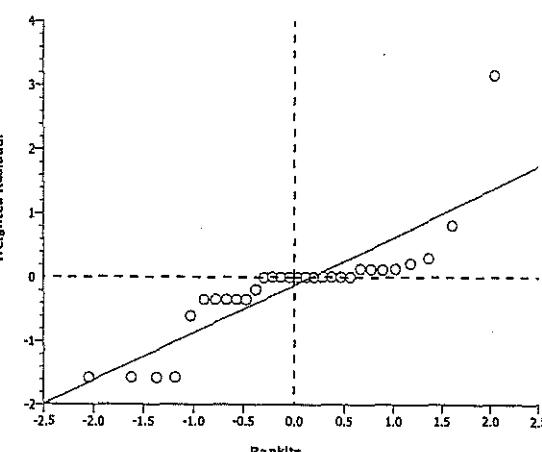
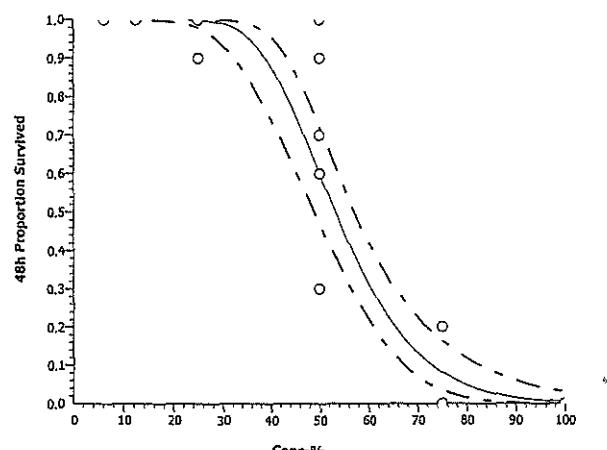
# CETIS Analysis Detail

Americamysis 96-h Acute Survival Test							EnviroSystems, Inc.						
Endpoint		Analysis Type		Sample Link	Control Link	Date Analyzed	Version						
48h Proportion Survived		Linear Regression		06-1931-8785	06-1931-8785	21 Nov-06 9:11 PM	CETISv1.026						
<b>Linear Regression Options</b>													
Model	Threshold Option	Lower Threshold	Threshold Optimized	Reweighted	Pooled Groups	Heterogeneity Corr.							
Log-Normal	Control Threshold	0	Yes	Yes	No	Yes							
<b>Regression Parameters</b>													
Parameter	Estimate	Std Error	95% LCL	95% UCL	t Statistic	P Level	Decision(0.05)						
Slope	9.36545	2.98562	3.24968	15.48123	3.137	0.03495	Significant						
Intercept	-11.16411	5.27242	-21.96417	-0.36405	-2.117	0.10163	Not Significant						
<b>Regression Summary</b>													
Iters	Log Likelihood	Mu	Sigma	G Stat	Chi-Sq	Critical	P Level						
9	-24.90264	-1.19205	0.10678	0.42643	129.27170	41.33714	0.00000						
							Significant Heterogeneity						
<b>Residual Analysis</b>													
Attribute	Method	Statistic		Critical	P Level	Decision(0.05)							
Variances	Modified Levene	2.44464		2.52766	0.05629	Equal Variances							
Distribution	Shapiro-Wilk W	0.66176		0.92671	0.00000	Non-normal Distribution							
<b>Point Estimates</b>													
% Effect	Conc-%	95% LCL	95% UCL										
50	53.20215	39.83447	62.59899										
<b>Data Summary</b>													
Conc-%		Calculated Variate(A/B)											
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SE	SD	A	B				
0	Lab Water	5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50				
6.25		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50				
12.5		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50				
25		5	0.98000	0.90000	1.00000	0.00913	0.04472	49	50				
50		5	0.70000	0.30000	1.00000	0.05590	0.27386	35	50				
75		5	0.04000	0.00000	0.20000	0.01826	0.08944	2	50				
100		5	0.00000	0.00000	0.00000	0.00000	0.00000	0	50				

# CETIS Analysis Detail

Linear Regression: Page 6 of 6  
Report Date: 21 Nov-06 9:13 PM  
Analysis: 13-5582-5949

## Graphics



# CETIS Analysis Detail

Americamysis 96-h Acute Survival Test							EnviroSystems, Inc.		
Endpoint	Analysis Type		Sample Link	Control Link	Date Analyzed	Version			
24h Proportion Survived	Trimmed Spearman-Karber		06-1931-8785	06-1931-8785	21 Nov-06 9:11 PM	CETISv1.026			
Spearman-Karber Options							Point Estimates		
Threshold Option	Lower Threshold	Trim Level	Mu	Sigma	EC50/LC50	95% LCL	95% UCL		
Control Threshold	0	2.00%	1.740996	0.01734829	55.08024	50.85098	59.66126		
Data Summary							Calculated Variate(A/B)		
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SE	SD	A	B
0	Lab Water	5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
6.25		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
12.5		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
25		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
50		5	0.72000	0.40000	1.00000	0.04873	0.23875	36	50
75		5	0.12000	0.00000	0.30000	0.02661	0.13038	6	50
100		5	0.02000	0.00000	0.10000	0.00913	0.04472	1	50

Graphics									
24h Proportion Survived	Conc-%	1.00	0.90	0.80	0.70	0.60	0.50	0.40	0.30
1.00	0	20	40	60	80	100			

# CETIS Analysis Detail

Americamysis 96-h Acute Survival Test							EnviroSystems, Inc.		
Endpoint	Analysis Type		Sample Link	Control Link	Date Analyzed	Version			
48h Proportion Survived	Trimmed Spearman-Karber		06-1931-8785	06-1931-8785	21 Nov-06 9:11 PM	CETISv1.026			
Spearman-Karber Options							Point Estimates		
Threshold Option	Lower Threshold	Trim Level	Mu	Sigma	EC50/LC50	95% LCL	95% UCL		
Control Threshold	0	0.00%	1.715447	0.0170865	51.93348	48.00367	56.18501		
Data Summary				Calculated Variate(A/B)					
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SE	SD	A	B
0	Lab Water	5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
6.25		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
12.5		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
25		5	0.98000	0.90000	1.00000	0.00913	0.04472	49	50
50		5	0.70000	0.30000	1.00000	0.05590	0.27386	35	50
75		5	0.04000	0.00000	0.20000	0.01826	0.08944	2	50
100		5	0.00000	0.00000	0.00000	0.00000	0.00000	0	50

Graphics																	
48h Proportion Survived	<p>The graph plots the 48-hour proportion survived against concentration. The curve shows a typical sigmoidal (S-shaped) survival response. At low concentrations (0-25%), survival is nearly 1.0. Between 25% and 75%, survival drops sharply, reaching approximately 0.05 at 75%. Above 75%, survival continues to decrease more gradually towards zero at 100% concentration.</p> <table border="1"> <caption>Data points estimated from the graph</caption> <thead> <tr> <th>Conc-%</th> <th>48h Proportion Survived</th> </tr> </thead> <tbody> <tr><td>0</td><td>1.00</td></tr> <tr><td>6.25</td><td>1.00</td></tr> <tr><td>12.5</td><td>1.00</td></tr> <tr><td>25</td><td>0.98</td></tr> <tr><td>50</td><td>0.70</td></tr> <tr><td>75</td><td>0.05</td></tr> <tr><td>100</td><td>0.00</td></tr> </tbody> </table>	Conc-%	48h Proportion Survived	0	1.00	6.25	1.00	12.5	1.00	25	0.98	50	0.70	75	0.05	100	0.00
Conc-%	48h Proportion Survived																
0	1.00																
6.25	1.00																
12.5	1.00																
25	0.98																
50	0.70																
75	0.05																
100	0.00																

# CETIS Analysis Detail

Americamysis 96-h Acute Survival Test						EnviroSystems, Inc.			
Endpoint	Analysis Type		Sample Link	Control Link	Date Analyzed	Version			
72h Proportion Survived	Trimmed Spearman-Karber		06-1931-8785	06-1931-8785	21 Nov-06 9:11 PM	CETISv1.026			
Spearman-Karber Options					Point Estimates				
Threshold Option	Lower Threshold	Trim Level	Mu	Sigma	EC50/LC50	95% LCL	95% UCL		
Control Threshold	0.02	0.00%	1.702921	0.01666668	50.45696	46.72910	54.48220		
Data Summary				Calculated Variate(A/B)					
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SE	SD	A	B
0	Lab Water	5	0.98000	0.90000	1.00000	0.00913	0.04472	49	50
6.25		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
12.5		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
25		5	0.98000	0.90000	1.00000	0.00913	0.04472	49	50
50		5	0.66000	0.30000	1.00000	0.05323	0.26077	33	50
75		5	0.00000	0.00000	0.00000	0.00000	0.00000	0	50
100		5	0.00000	0.00000	0.00000	0.00000	0.00000	0	50

Graphics	

# CETIS Analysis Detail

Americamysis 96-h Acute Survival Test						EnviroSystems, Inc.			
Endpoint	Analysis Type		Sample Link	Control Link	Date Analyzed	Version			
96h Proportion Survived	Trimmed Spearman-Karber		06-1931-8785	06-1931-8785	21 Nov-06 9:11 PM	CETISv1.026			
Spearman-Karber Options					Point Estimates				
Threshold Option	Lower Threshold	Trim Level	Mu	Sigma	EC50/LC50	95% LCL	95% UCL		
Control Threshold	0.02	0.00%	1.63419	0.02162712	43.07151	38.98845	47.58219		
Test Acceptability									
Attribute	Statistic		Acceptable Range	Decision					
Control Response	0.98		0.9 - N/A	Passes acceptability criteria					
Data Summary			Calculated Variate(A/B)						
Conc-%	Control Type	Count	Mean	Minimum	Maximum	SE	SD	A	B
0	Lab Water	5	0.98000	0.90000	1.00000	0.00913	0.04472	49	50
6.25		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
12.5		5	1.00000	1.00000	1.00000	0.00000	0.00000	50	50
25		5	0.88000	0.80000	1.00000	0.01708	0.08367	44	50
50		5	0.50000	0.30000	0.80000	0.03819	0.18708	25	50
75		5	0.00000	0.00000	0.00000	0.00000	0.00000	0	50
100		5	0.00000	0.00000	0.00000	0.00000	0.00000	0	50
Graphics									
96h Proportion Survived									
Conc-%									



# Aquatic Research Organisms

## DATA SHEET

### I. Organism History

Species: AMERICANASIS bahia  
Source: Lab reared \_\_\_\_\_ Hatchery reared \_\_\_\_\_ Field collected \_\_\_\_\_  
Hatch date 11-14-06 Receipt date \_\_\_\_\_  
Lot number 111406MS Strain \_\_\_\_\_  
Brood Origination FLORIDA

### II. Water Quality

Temperature 25 °C Salinity ≈30 ppt DO —  
pH 7.8 Hardness — ppm

### III. Culture Conditions

System: Recirc  
Diet: Flake Food ✓ Phytoplankton \_\_\_\_\_ Trout Chow ✓  
Brine Shrimp ✓ Rotifers \_\_\_\_\_ Other Eucap Shrimp Diet

Prophylactic Treatments: \_\_\_\_\_

Comments: \_\_\_\_\_

### IV. Shipping Information

Client: EST # of Organisms: 580 + 20R  
Carrier: \_\_\_\_\_ Date Shipped: 11-16-06

Biologist: Mark Rosenberg

1 - 800 - 927 - 1650

PO Box 1271 • One Lafayette Road • Hampton, NH 03842 • (603) 926-1650

**EFFLUENT & DILUENT CHEMISTRY and WATER QUALITY DATA**

PARAMETER	100% Effluent	50% Effluent	Diluent - Lab Salt
TRC	≤0.05		≤0.05
As Received - pH (SU) @ 20°C	6.57		7.70
As Received - Salinity (ppt)	10.7		25
As Received - Dissolved Oxygen (mg/L)‡	1.6		16 (E3) 7.1
As Received - Ammonia (pull)	-002		15206-016
Salinity Adjusted - pH (SU) @ 20°C	7.48	7.59	
Salinity Adjusted - Salinity (ppt)	25.3	25	
After Aeration - Dissolved Oxygen (mg/L)	7.5	7.4	
Salinity Adjusted - Ammonia (pull)		-005	
48 hour Ammonia (pull)	-004	-005	00015206(E3)-023
48 hour pH (SU) @ 20°C	7.01	7.92	7.95

‡ - Aerate prior to mixing concentrations.

**PREPARATION OF DILUTIONS**

STUDY: 15231		CLIENT: CH2M HILL - American Samoa						
SPECIES: <i>A. bahia</i>								
Diluent:	Day: 1	Day: 2						
Lab Salt	Sample: EOA		Sample: EO					
Concentration	Vol. Eff.	Final Vol	Vol. Eff.	Final Vol	HRS	Date	Time	Initials
LAB	0	1000	0	750	0			
6.25%	62.5	/	46.9	/	48	11/18/06	1415	YR
12.5%	125	/	93.75	/				
25%	250	/	187.5	/				
50%	500	/	375	/				
75%	750	/	562.5	/				
100%	1000	↓	750	↓				

Comments:  
AERATE SAMPLE PRIOR TO  
MIXING DILUTIONS AT START  
AND 48 HOURS.

# RECORD OF METERS USED FOR WATER QUALITY MEASUREMENTS

STUDY: 15231	CLIENT: CH2M HILL - American Samoa					
WATER QUALITIES - A. bahia						
HOURS:	0	24	48 - old	48 - new	72	96
Water Quality Station #	1	2	2	2	2	2
Initials	CS	CS	YH	YS	SJ	CS
Date	11/16/06	11/17/06	11/18/06	11/18/06	11/19/06	11/20/06

Water Quality Station #1	Water Quality Station #2		COMMENTS
DO meter #	3	DO meter #	19
DO probe #	13	DO probe #	2
pH meter #	41097	pH meter #	470
pH probe #	44	pH probe #	48
S/C meter #	USI30C	S/C meter #	USI30C
S/C probe #	↓	S/C probe #	↓
Salinity meter #	↓	Salinity meter #	↓

Report No:	15231	SDG:				
Project:	Joint Cannery Outfall					
Sample ID:	Effluent Start 100%					
Matrix:	Water					
Sampled:	11/08/06 0700					
Parameter	Result	Quant Limit	Units	Date Prepared	Date of Analysis	Method/Reference
Ammonia-N	15231-003 60	0.2	mg/L as N	11/30/06	11/30/06	SM 4500-NH3 G
Sample ID:	Effluent Start 50%					
Sampled:	11/08/06 0700					
Ammonia-N	15231-003 34	0.2,	mg/L as N	12/02/06	12/02/06	SM 4500-NH3 G
Sample ID:	Effluent 48HR 100% - 11/18/06					
Sampled:	11/18/06					
Ammonia-N	15231-004 33	0.5	mg/L as N	12/12/06	12/12/06	SM 4500-NH3 G
Sample ID:	Effluent 48HR 50% - 11/18/06					
Sampled:	11/18/06					
Ammonia-N	15231-005 20	0.5	mg/L as N	12/12/06	12/12/06	SM 4500-NH3 G
Sample ID:	Lab Control - 11/18/06					
Sampled:	11/18/06					
Ammonia-N	15231-006 5.3	0.1	mg/L as N	12/12/06	12/12/06	SM 4500-NH3 G

ESI

STUDY: 15231  
CLIENT: CH2MHill - American Samoa  
PROJECT: Wastewater Treatment Plant  
TASK: Unionized Ammonia Calculations

Day / Date	Treatment	Temperature Deg C	Sample		Unionized	
			pH SU	NH3 mg/L	NH3 mg/L	
Day 0	Lab Diluent	20	7.70	0.10	0.002	
	50% Effluent	20	7.59	34.0	0.516	
	100% Effluent	20	7.48	60.0	0.709	
Day 2	Lab Diluent	20	7.94	5.3	0.177	
	50% Effluent	20	7.99	20.0	0.745	
	100% Effluent	20	8.34	33.0	2.630	

**ESI**

EnviroSystems, Inc.  
One Lafayette Road  
P.O. Box 778  
Hampton, NH 03843-0778  
Telephone: 603-926-3345

## SAMPLE RECEIPT RECORD

ESI STUDY NUMBER: 15231 CLIENT: American Samoa

SAMPLE RECEIPT:

DATE: 11/16/06 TIME: 1200 BY: CS

DELIVERED VIA:  FEDEX  CLIENT  ESI  UPS  OTHER

LOGGED INTO LAB:

DATE: 11/16 TIME: 1320 BY: CS

SAMPLE CONDITION:

CHAIN OF CUSTODY:  YES  NO

CHAIN OF CUSTODY SIGNED:  YES  NO

CHAIN OF CUSTODY COMPLETE:  YES  NO

SAMPLE DATE:  YES  NO

SAMPLE TIME RECORDED:  YES  NO

SAMPLE TYPE IDENTIFIED:  YES  NO

CUSTODY SEAL IN PLACE:  YES  NO

SHIPPING CONTAINER INTACT:  YES  NO

SAMPLE TEMPERATURE (AT ARRIVAL): 17.6 °C

DOES CLIENT NEED NOTIFICATION OF TEMPERATURE?

YES  NO

SAMPLE ARRIVED ON ICE:  YES  NO

COMMENTS:

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## APPLIED SCIENCES LABORATORY

## CHAIN OF CUSTODY RECORD AND AGREEMENT TO PERFORM SERVICES

CH2M Hill Project # <b>147323, JC, OG, TW</b>		Purchase Order # <b>PHONES</b>	# OF CONTAINERS	LAB TEST CODES								SHADED AREA-- FOR LAB USE ONLY								
Project Name <b>JOINT CANNERY OUTFALL</b>										Lab 1 #	Lab 2 #									
Company Name/CH2M HILL Office <b>CH2M HILL</b>		PO BOX 1238 TRINIDAD, CA 95570								Quote #	Kit Request #									
Project Manager & Phone # Mr. [ ] <b>STEVE COSTA</b> Ms. [ ] Dr. [ ] <b>707-677-0123</b>		Report Copy to: <b>SAME</b>		ANALYSES REQUESTED								Project #								
Requested Completion Date:		Sampling Requirements			Sample Disposal:											No. of Samples	Page of			
		SDWA		NPDES	RCRA	OTHER	Dispose	Return									Login	LIMS Ver.		
Sampling		Type		Matrix				CLIENT SAMPLE ID (9 CHARACTERS)								REMARKS	LAB 1 ID	LAB 2 ID		
Date	Time	C O M P R E R		G R A T E R	W A T E R	S O I L	A I R									100-30-25-125 6.25 - <del>100</del>				
7-8 NOV 2006	X X	JCO		-	O	G	T	W	1	X									AS BEFORE	
Sampled By & Title <b>SK Costa</b>		(Please sign and print name)		Date/Time <b>7-8 Nov 06</b>		Relinquished By <b>SK Costa</b>		(Please sign and print name)		Date/Time <b>9 Nov 06</b>		QC Level: 1 2 3 Other: <b></b>								
Received By <b>Ch. Shultz</b>		(Please sign and print name)		Date/Time <b>11/16/06/2006</b>		Relinquished By <b></b>		(Please sign and print name)		Date/Time <b></b>		COC Rec <b></b>								
Received By <b></b>		(Please sign and print name)		Date/Time <b></b>		Relinquished By <b></b>		(Please sign and print name)		Date/Time <b></b>		Ana Req <b></b>								
Received By <b></b>		(Please sign and print name)		Date/Time <b></b>		Shipped Via UPS      BUS      Fed-Ex      Hand      Other <b>DHL</b>		Shipping # <b>782-0788-441</b>		TEMP <b></b>										
Work Authorized By <b></b>		(Please sign and print name)		Remarks <b>NOTE SOP FOR AERATION PROTOCOL</b>						Cust Seal <b></b>										

Instructions and Agreement Provisions on Reverse Side

DISTRIBUTION: Original - LAB, Yellow - LAB, Pink - Client  
REV 3/94 FORM 340